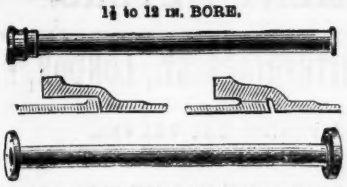
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXII. No. 1580.] LONDON, AUGUST 22, 1893. [45TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



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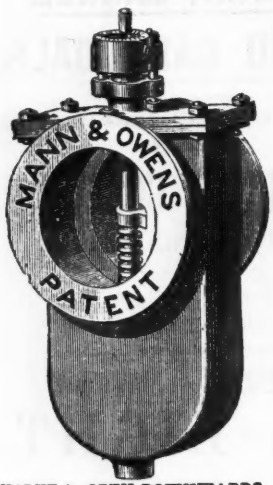
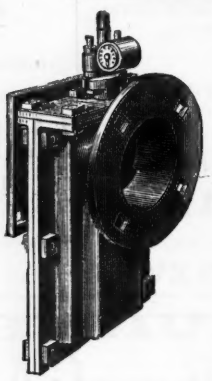


VALVE to OPEN DOWNWARDS.



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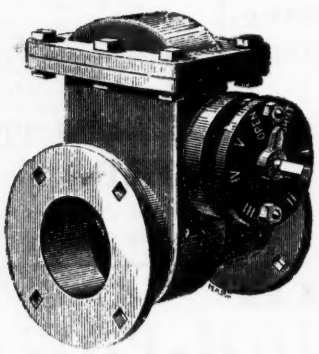

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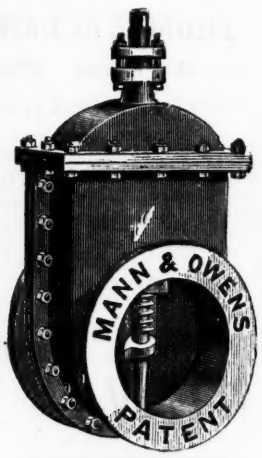

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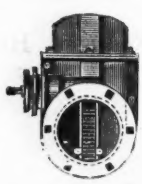

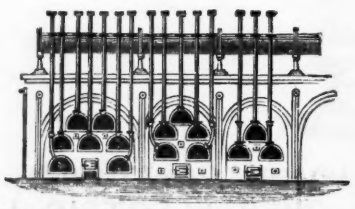

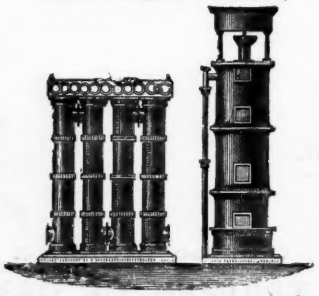

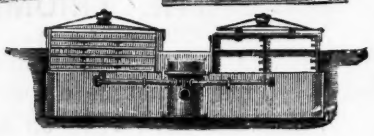

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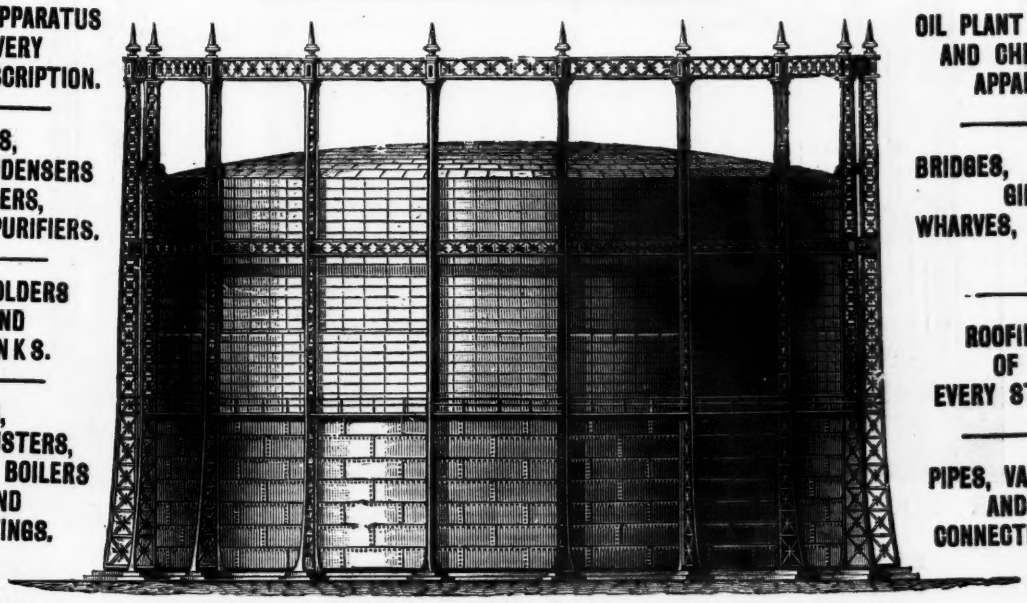

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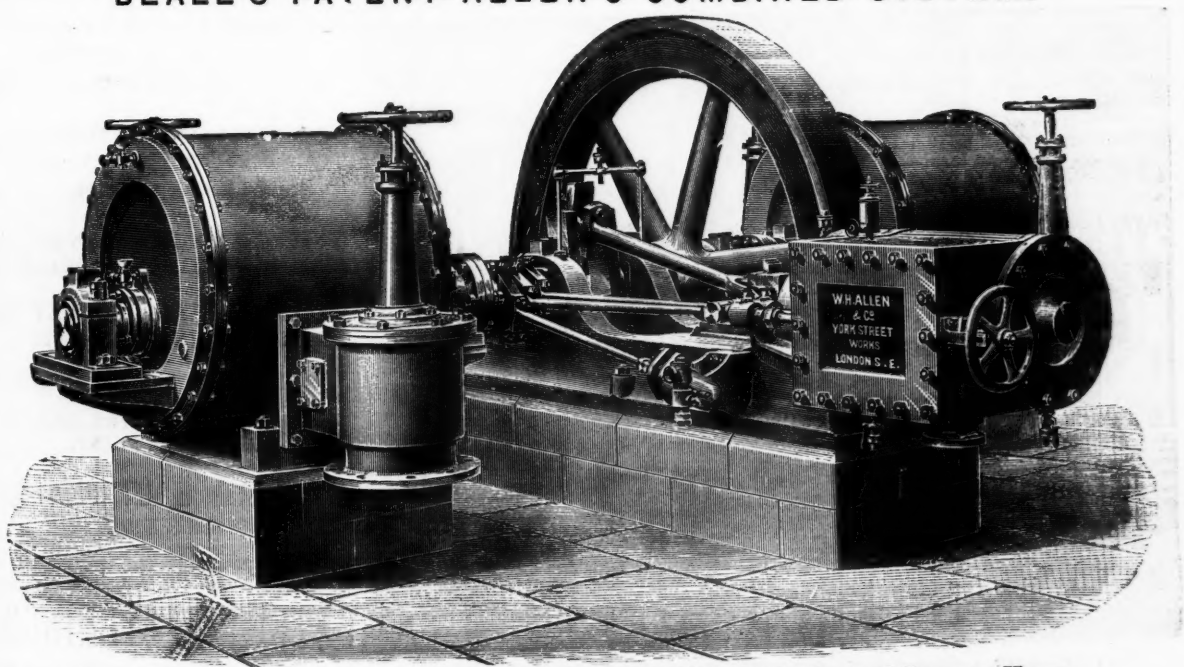

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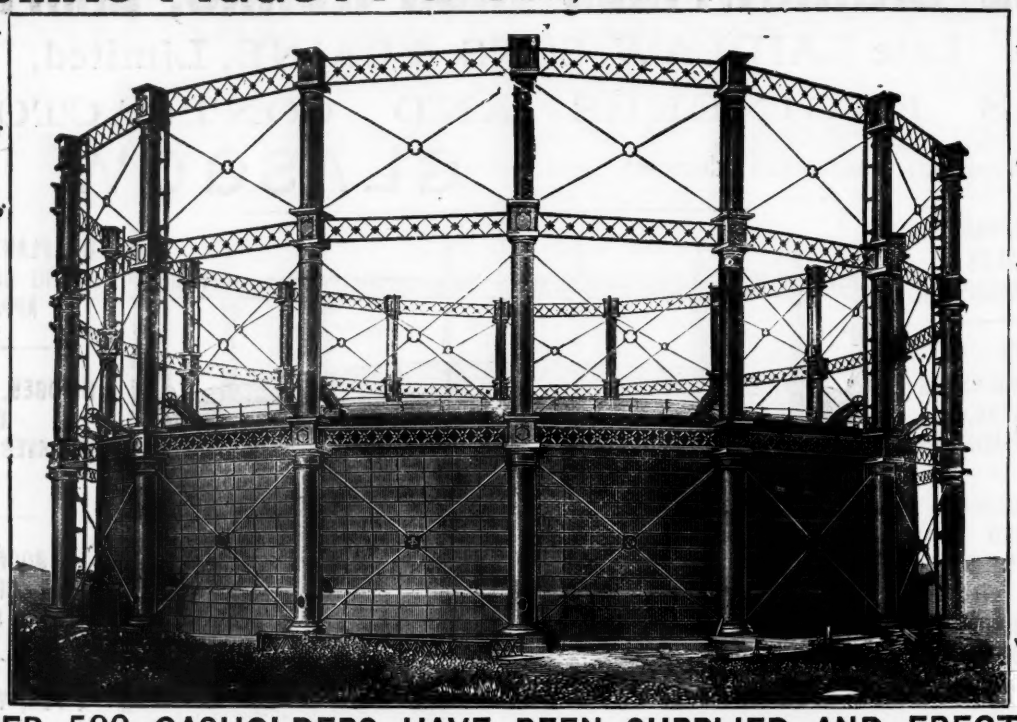

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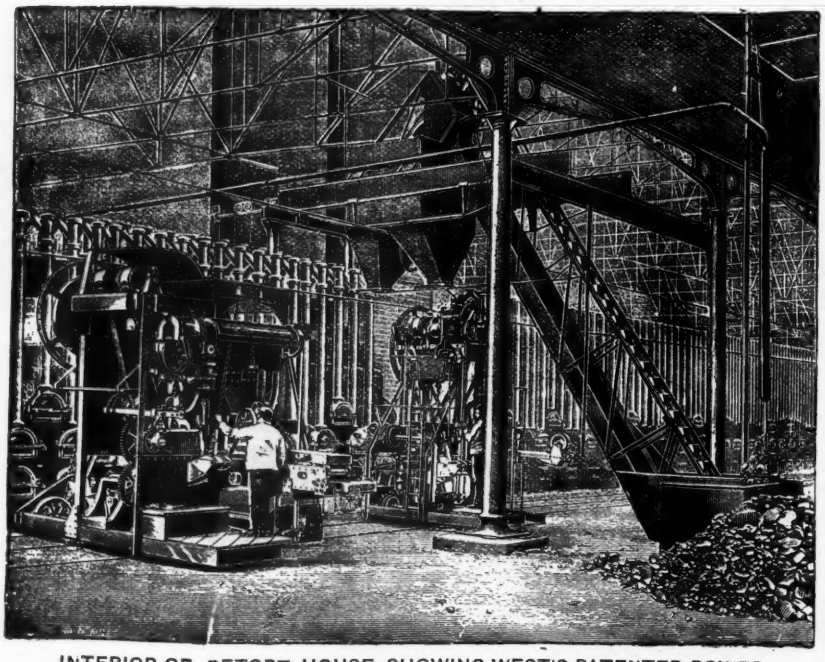
OVER **240** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.



INTERIOR OF RETORT-HOUSE, SHOWING WEST'S PATENTED POWER CHARGING AND DRAWING MACHINERY.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES.

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FITTED WITH

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N.B.—The whole of these Fittings are made of Wrought Iron.

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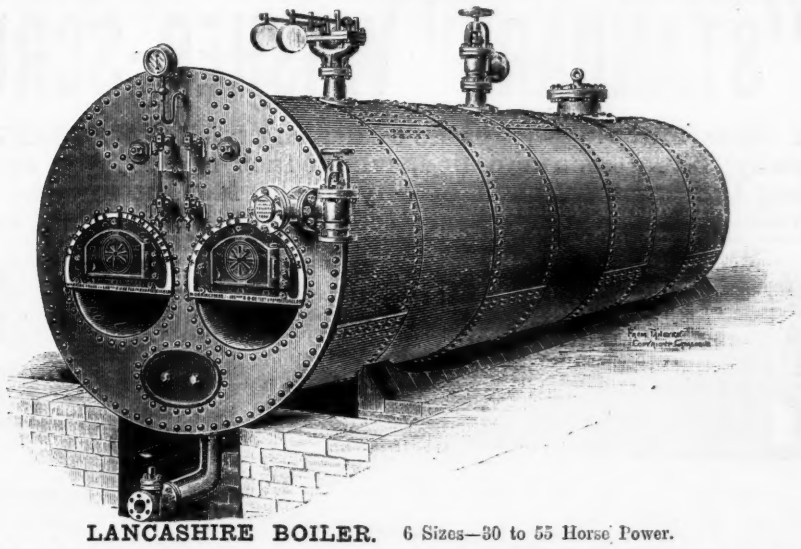

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MADE OF BEST MILD STEEL PLATES, BY SPECIAL MACHINERY,

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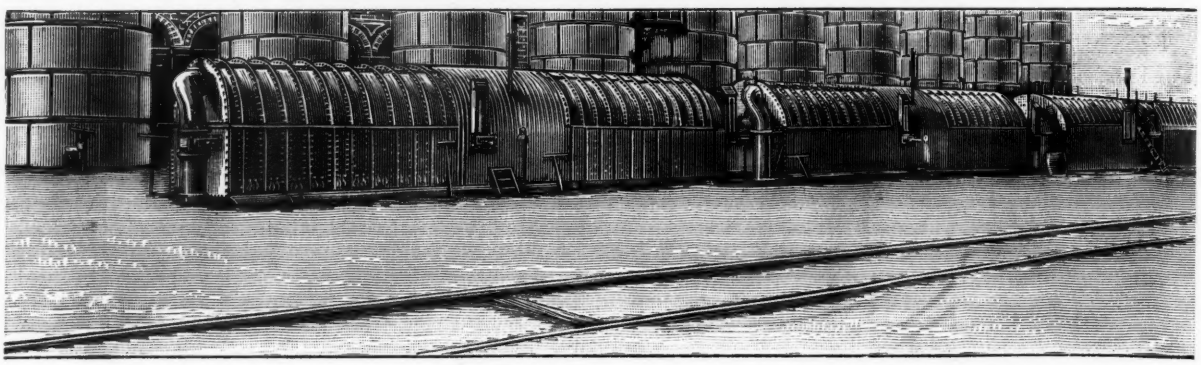
☛ **465** of these Machines (capable of dealing with **440,807,000** cubic feet of Gas daily) have been supplied, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company has **27** of these Machines in use; and they are also in operation at a great number of Gas and other Works in this Country and abroad.

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NEARLY

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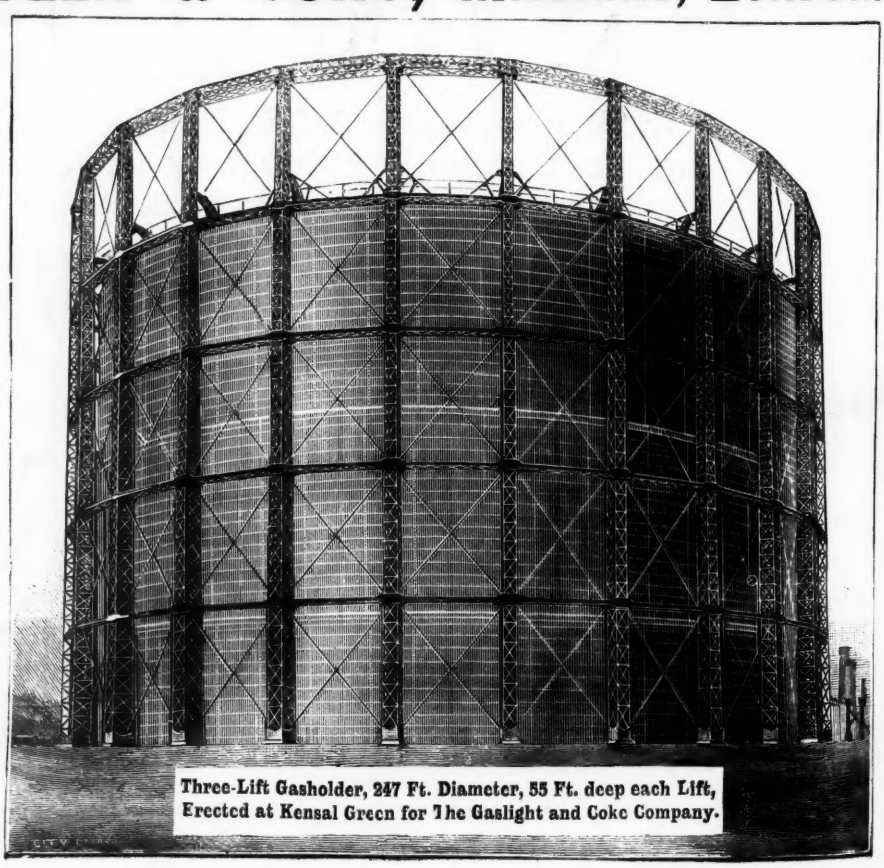
CUBIC FEET

CAPACITY.



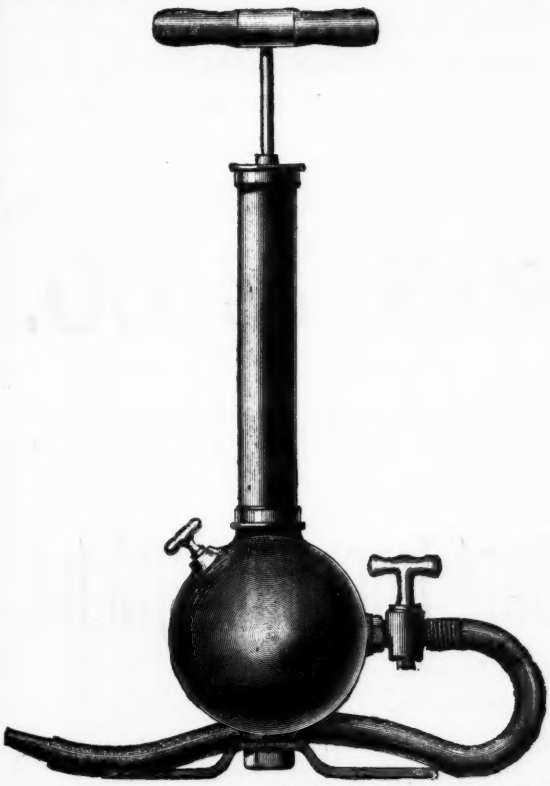
Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

IMPROVED
SERVICE CLEANSER

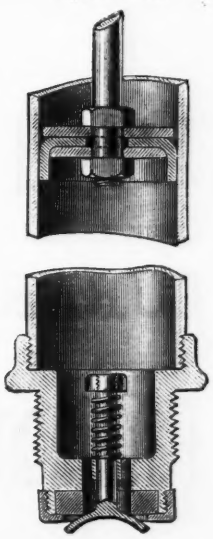
(FIDDES & STAGG'S PATENT)

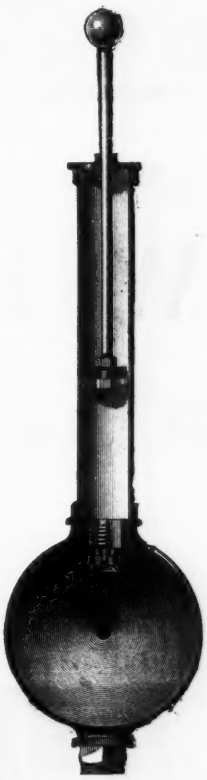
For Removal of Naphthaline or other Obstruction in Services or Fittings.

THE improvement consists in adopting a leather cup as a plunger. When the plunger is drawn up, the supply of air passes down between the cup and the tube; and on the cup being forced down to charge the bulb, the pressure closes the cup against the tube, and the air is forced into the receiver, whence its return is arrested by a valve so constructed as to be absolutely air-tight under all the general conditions of grit settlement between the valve-disc and its seating. The ordinary valve in the plunger is thus dispensed with; and the air, in passing the leather, is practically filtered before it reaches the valve beneath.



PLUNGER CUP.





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1st. A high and permanent pressure is obtained.
2nd. Simplicity of construction.
3rd. Not liable to become defective.
4th. Strong, light, and compact, so that it can be carried conveniently.
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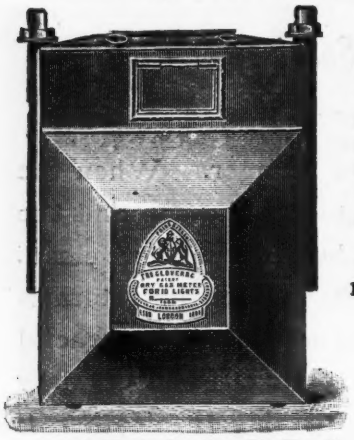
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
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4th.—Cannot become fixed by Frost, however severe
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.
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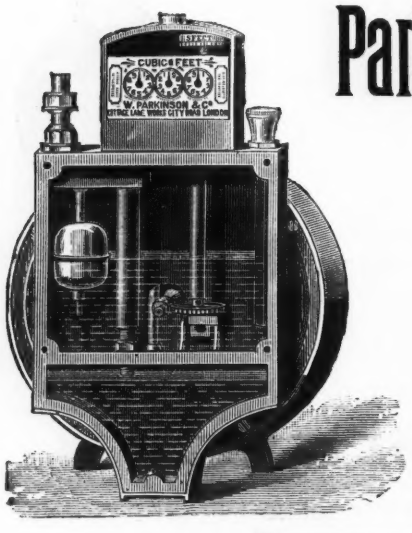

Parkinson's Cast-Iron Case Meter.

Works with very little friction.
Will stand very high pressures.
Cannot possibly be shut off by sudden increase of pressure; the float being affected by outlet gas only.
Allows for loss of water by evaporation without materially affecting the registration or shutting off the gas.
Unexcelled for Simplicity of Construction, Excellence of Workmanship, and Accuracy of Registration.

COMPENSATING METERS,

In Tinned or Cast-Iron Cases.

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TO CORRESPONDENTS.

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Telegraphic Address: "GASKING LONDON."
Telephone Number: 2759.

THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 22, 1893.

The South Metropolitan Company's Meeting.

THE South Metropolitan Gas Company's meeting last week, being fixed for perhaps the very hottest hour of a broiling hot day, was less well attended than usual. Those proprietors who did brave the terrors of the sultry streets, and the climb to the upper chamber of the Bridge House Hotel, wherein these half-yearly gatherings are held, were rewarded by hearing one of their Chairman's bright, informing addresses, and by being dismissed, after a brief sitting, with the assurance that all is well with the South London gas undertaking. Unfortunately, two of the Directors were not at the meeting for reasons which command sympathy—Mr. B. L. Smith because of a personal injury, and Mr. R. Morton on account of the death of his eldest son, drowned while bathing at St. Andrews. The condolences of all our readers will be extended to the bereaved parents and the remaining members of the family in this their heavy affliction. Mr. George Livesey spoke at considerable length upon the principal topics mentioned in the report; dilating especially upon the prospects and experiences of the Company with automatic prepayment meters. We do not propose to discuss this subject at present, but would desire to mention that Mr. Livesey's remarks respecting the system appear to have struck the conductors of several London newspapers. One never knows what will occur to these watchers and purveyors of public opinion as matter of paramount general interest; and in all probability Mr. Frank Livesey was somewhat surprised when a representative of the *Daily Graphic* called on him with the object of having the "interview" on the subject of the "penny-in-the-slot" meter which was duly reported in that newspaper on Friday last. There is nothing in this statement to add to the Chairman's speech and Mr. F. Livesey's own letter in our last week's issue. The gratifying thing is that all the newspapers that have noticed the Company's proceedings in this regard recognize the benefits that a supply of gas confers upon the poor householder. We should not wonder if this introduction of the automatic prepayment meter to the general public has the effect of sending up the value of gas stock, by reason of the reminder it supplies of the fact that the possibilities of the gas industry are not yet by any means exhausted.

Mr. Livesey also spoke in a very sanguine spirit respecting the results of the profit-sharing experiment; and he put the matter in a new light by declaring that every penny of the apportionment which appears in the Company's revenue accounts under this head is really provided by the men themselves, as a result of the economical and efficient working due to the operation of the system. In speaking of the Company's recent litigation in defence of their sulphate works, which swells the charge for legal expenses for the past half year, the Chairman quoted somebody as saying that "victory is cheaper than defeat." This phrase, if we remember rightly, was first employed to defend the expenditure upon the great French wars of the last and the early part of the present century; and it is an aphorism well worth bearing in mind. There is little comment to be made upon Mr. Livesey's remarks, which will be found reported in another column. The South Metropolitan Company are experiencing a period of peace; and this, though satisfactory, is not exciting in the narration.

The Gas Supply of Liverpool.

THE annual general meeting of the Liverpool United Gaslight Company was held on Thursday last, under the presidency of Mr. Edward Lawrence, Chairman of the Company. The past year's working of the undertaking has not resulted in sufficient profit to clear the dividends; the sum of £18,790 having to be taken from the reserve fund for this purpose. The deficiency arose mainly from the depreciation of the value of coke and tar. The Chairman stated that the working for the ensuing year will benefit by cheaper coal; but he prudently said nothing very hopeful about the residuals market. He admitted that tar would probably fall still lower; but he was disposed to expect better things of sulphate. Mr. Lawrence then proceeded to make some allusions to the coal-fields difficulty, which were, of course, pounced upon by the reporters, and repeated throughout the land as the observations of a Chairman of a large Gas Company upon the way in which gas supply may be affected by the miners' strike. He is reported to have declared that the Company have "an anxious time before them for the next few "weeks;" because, although they have stocked themselves with material "so as to be prepared for a siege," their stocking power is limited. He also said "he thought "that the public might so far assist them by taking care "that there was no unnecessary waste of gas during the "coming weeks; and he considered it their bounden duty "to meet them in a case of that kind." When we read these remarks, it might have been imagined for the moment that the report referred to the proceedings at some water company's meeting, and that the speaker was dealing with a problem presented by the prolonged drought

To talk in a public assembly about waste of water on the part of a community is one thing; but how or in what sense do people unnecessarily "waste" gas? And how are the gas consumers of Liverpool to "meet" the Gas Company in the almost inconceivable case of the supply running short? It is to be concluded, regretfully, that the respected Chairman of the Liverpool Gas Company was on this occasion guilty of a slight slip of the tongue, and talked nonsense without meaning it. It might be pernicious nonsense if it acted as an encouragement to the strikers, whose leaders are as fond of talking about the advantage of bringing outside pressure to bear upon the employers as they are keen to watch the doings of railway and gas companies and other large users of coal. There are plenty of sources of coal supply open to the Liverpool Gas Company; and it would have been more to the point if the Chairman had reminded the public of this fact, and told them to go on burning cheerfully as much gas as they wanted, instead of falling into the alarmist tone he so mistakenly adopted.

Street Lighting and Rates and Taxes.

One is accustomed to find curious statements and arguments respecting gas supply in the daily newspapers; but one of the strangest pieces of what we suppose must be classified as reasoning that we ever came across appeared in a London newspaper by way of comment on a remark by Colonel Makins at the recent general meeting of The Gaslight and Coke Company. The Governor said, among other things, that the amount paid by the Company in rates and taxes represents a burden of 2¼d. per 1000 cubic feet of gas sold, which, of course, comes directly out of the consumers' pockets. This observation was seized by the newspaper writer as "an argument for the ownership of "the great gas monopoly by the people of London, who "might then be able to get as good light in their streets "as Birmingham enjoys for a much less sum than we pay "in London." We have turned this proposition inside out and round about, and nowhere can we find the logical connection which must be presumed to have existed in the mind of the writer between the incidence of rating mentioned by Colonel Makins and the cost of Metropolitan street lighting. It may perhaps be objected that this is a small matter, and that newspapers are not to be read for their logic. All the same, they must be perused for their prejudices, and as a means of ascertaining what is in the public mind with regard to the gas supply and other matters that are of general interest. It is at least certain that the money paid by the different local authorities for the street lighting of London does not contribute in any notable degree to the rates, for this class of business does not pay the "hypothetical tenant" who is supposed to fix the value of the gas undertakings for the purpose of assessment. And as to the supply of public lamps by local authorities owning gas undertakings, not only in Birmingham, but also in other large cities and towns throughout the British Isles, we should hesitate before accepting as a matter of course the statement that they do actually light their streets better than is the case where gas is supplied at about equal prices by Companies to the order of highway authorities. It is true that in Birmingham, as elsewhere, there are some brilliant examples of street lighting by Corporation Gas Departments; but so there are in London and many quite small towns wherein gas is supplied by Companies at a reasonable rate. The question of rates and taxes has no more to do with the result than has the man in the moon. Street gas lighting has greatly improved of late years, thanks in a large measure to the influence of the defunct Jablochkoff candle; but much still remains to be done, and especially in regard to the lighting of poor and thickly populated town neighbourhoods, which even local authorities are too prone to neglect while glorifying the vicinage of the Town Hall and their main lines of thoroughfare. The street lamp fulfils the double duty of guiding traffic and aiding in the preservation of the public peace; and the question of which duty comes uppermost depends upon situation. Glasgow and Birmingham have lately done a good deal to remove the reproach of darkness, the cloak of vice and crime, which lay upon their unlit common stairs and secluded courts; and doubtless they are not without their reward. We have admitted the beneficent influence exercised by powerful electric lamps in persuading highway authorities to favour improved lighting for busy thoroughfares and dangerous street crossings; but there is another side to the picture which should not be overlooked. It is equally true that in certain town districts—and notably in London—the prospect of getting cheap and powerful electric lighting at some undefined future date has operated to prevent the authorities from giving the public the advantage of improved gas-lamps in the present. Year after year important thoroughfares have had to go dimly lighted, because it has been prophesied that "the light of "the future" was being got ready for them. This pretence is being gradually worn down; but it is not yet dispelled, as we hope it may be in time. Meanwhile, it should be an ever-present study with gas engineers to cultivate and improve their street-lighting connection. It does not pay in the immediate and direct sense. But the community at large, which is something more and above any local government authority, has a right to good and ample lighting; and those who believe that this can best be supplied by the agency of gas must not be deterred, by any temporary wave of unpopularity, from endeavouring to express their faith in action.

Mr. J. Aitken on Gas and Oil Flames.

As will be seen by the report given in another column of the proceedings, at the congress of the British Institute of Public Health, recently held in Edinburgh, Mr. John Aitken, of Falkirk, has been expatiating again upon the fog-forming proclivities of gas-flames, and has proved to the perfect satisfaction of those who follow his interesting experiments that the supposed panacea of gaseous fuel will never prevent the formation of fogs so long as there is sulphur in it. He showed at the meeting a trick with two gas globes, and exhibited the difference between the action of a gas-flame upon the atmosphere and that of a paraffin lamp. The former made plenty of fog on account of the sulphur which it yielded, while the latter was comparatively harmless in this respect. Now, this is very unkind and inconsiderate of Mr. Aitken, since it tends to redeem the character of the troublesome and dangerous oil-lamp, and goes counter to the efforts of gas engineers to reduce its numbers by the expedient of the automatic prepayment meter and otherwise. Henceforward we may expect enthusiastic sanitarians to sing the praise of the oil-lamp as a foe to fog, and abuse the gas-flame on account of its sulphurous nature; while the character of the gas cooking-stove, as an agent for reducing the summer fog in towns, will be seriously depreciated. Sanitarians are nothing if not enthusiastic, and it is possible that the successor to Lord Stratheden and Campbell may ask Parliament to make it penal to light London by any other means than lamps burning Scotch oil, and thus secure two desirable objects at a blow—the abolition of fogs and the restoration of a Scotch industry to a flourishing condition. Unfortunately for those who would like to see the atmosphere of British towns clear, there is even less likelihood of the substitution of dirty coal fires by liquid fuel than there is of the adoption of gaseous fuel. Both kinds of combustible can be, and are, used to a considerable extent at home and abroad. The Chicago Exhibition machinery is being "run" by oil firing; and the same agency is helping Russia to civilize Northern Asia. The Great Eastern Railway has many locomotives stoked by the tar made in the Pintsch gas process; and Mr. Livesey told the South Metropolitan shareholders the other day that coal tar is once more at its mere fuel value. All the same, we do not expect to live to see oil-lamps replace coal-fires upon the domestic hearth; and it is here that the smoke originates which converts a harmless mist into a choking "London particular." Nevertheless, it is well to remember betimes that an oil-stove is a capital thing for the small hall of the average town dwelling, when the draughts of winter render the maintenance of a comfortable internal temperature almost impossible by the method of open fires in the rooms.

The Question Papers in "Gas Manufacture."

The programme of the Technological Examinations of the City and Guilds of London Institute for the ensuing year has been issued; and it is to be had on application at the Institute, South Kensington. As usual, it contains the syllabus of the examinations in "Gas Manufacture" among the other subjects, by which intending candidates may ascertain the probable bearings of the questions they will have to answer next May. It also contains the last question papers, which show what was the nature of the

test applied to the successful candidates whose names we recently published. It would be a tolerably fair description of these papers to say that they indicate the progress of a tendency to simplify the requirements in the Ordinary Grade, and to stiffen those in the Honours Grade. This is as it should be. The successful candidate in the Ordinary Grade need have no more than a broad, common-sense knowledge of the fundamental processes employed in making, purifying, and distributing gas. There is nothing "catchy" in the elementary paper. On the other hand, there is no nonsense about it; and the questions call for accuracy in matters of principle, although there is no insistence upon details. The Honours paper is aimed directly at the intelligent advanced student in a well-conducted gas-works, and is consequently a "cut "above" the usual run of book-learned amateurs and ambitious "handy men." This year it is incisive, but does not render arithmetical computation necessary, which is to the credit of the Examiner (Mr. Charles Hunt). Mr. Robert Morton retains his connection with the Institute; his name being included in the list of Consultative Examiners.

The Strikes of Coal Miners.

MATTERS appear to be growing distinctly worse in connection with the South Wales coal miners' strike; the disturbances that have occurred in and about the Ebbw Vale having attracted public attention to the state of affairs in this region, to the temporary eclipse of the doings of the Midland strikers. To do the Federation men justice, they seem disposed to remain quietly observant of the effect of the suspension of production; and there is the less temptation to break the peace in their case, inasmuch as they have no internal dissensions to excite them to disorder. Where the Federation reigns supreme, there is no conflict, because there is no adversary. To a large area of the coal-producing parts of England, the remark of the Roman satirist applies: "They make a "desert, and call it Peace." The masters are taking their holidays, like the men; and if the strike should eventually result in forcing up the price of coal, one party will be as well pleased as the other. Once more credit must be accorded to the Federation Executive, for having made arrangements for obviating the cruelty to animals and damage to property that attended the last Durham strike. In South Wales, unhappily, there is a revolt of miners not only against their employers, but also against their own duly-appointed leaders; and Mr. W. Abraham, M.P., who as "Mabon" has long enjoyed the insecure eminence of a popular idol, has actually been assaulted. It is one of the most disappointing features of the South Wales outbreak that the strikers have set at nought the counsels of the Sliding-Scale Committee, to whom they have repeatedly given nominally plenary powers to adjust rates of wages. It was only in February that a conference of delegates from the various collieries, representing 68,557 men, asked the Committee "to throw themselves heart and soul into the "work of promoting and establishing a gigantic and ideal "organization;" and now, at the first action of the Committee which is not acceptable to some of the miners, the whole scheme of amicable wage regulation by agreement between employers and employed is upset. It is this lack of loyalty of the workmen to their own chosen leaders that creates and encourages scepticism in regard to the validity of Conciliation or Arbitration Boards as means of preventing strikes. While it continues to be necessary to rely upon the military to keep the peace in the most highly-organized of mining districts, it is not to be wondered at that the general public should doubt the value of the discredited organization. There is no question here of unionists against free labourers; and the most violent partisan of Trade Unionism must confess that the spectacle exhibited by South Wales at the close of last week was not, to say the least, creditable to the spirit of Unionism.

The Gas Managership at Peterhead.—Mr. James Kincaid, assistant in the Dumbarton Corporation Gas-Works, has been appointed Manager of the Peterhead Corporation Gas-Works, in succession to Mr. John Mackay, resigned.

Salt Lake and Ogden Gas and Electric Light Company.—The letters of allotment for the 6 per cent. first mortgage gold bonds of this Company, whose prospectus appeared in the JOURNAL for the 8th inst., were posted last week.

ESSAYS, COMMENTARIES, AND REVIEWS.

ELECTRIC LIGHTING MEMORANDA.

Failures of the Electric Light—Fall in American Electrical Stocks—No Arc Lamps for the Strand—The Affairs of Crompton and Co., Limited.

IT was reported in one of the London newspapers that, on the occasion of the largest conflagration that has happened in the North of London for many years, which occurred on the night of Monday of last week, it was noticed, while the fire was at its height, that the electric lights in the street were gradually losing their brilliancy. This went on until, at eleven o'clock, they went out altogether. At the same time the fire was got under, and the street was in complete darkness for more than an hour. There was present a large and excited mob; and the work of the police and the Fire Brigade was naturally rendered exceptionally difficult and dangerous. This breakdown will hardly be classed among the successes of the St. Pancras Vestry electric lighting undertaking. Another illustration of the malignity of Fate in connection with electric lighting was supplied by the collapse on Bank Holiday night of the arc lamps on Hastings pier and along the sea-front. This might have led to serious results; and, as it was, considerable alarm prevailed until the gas-lamps were lit. A similar failure interrupted the proceedings at a swimming club entertainment in the Hastings Baths on Monday last. Intelligence of irritating mishaps of the kind frequently reaches us; but on the occasions now in question, as well as that noticed in the JOURNAL last week (p. 318), the inconvenience of the sudden plunge into darkness must have been particularly acute.

According to an American journal, the recent fall in the prices of all native securities has been attended by a great decline in the value of the stock of the General Electric Company, which represents the consolidated Edison, General, and Thompson-Houston Electric Companies. Since last October this stock has declined from 120 to 31¼. How much of this is due to panic, and how much to any really trustworthy estimate of the earning capacity of the concern, it is impossible to say. The fact is, however, worthy of notice, as the General Electric Company represents the principal electrical interest in the country. It is, in short, all that Wall Street knows about electric lighting development. The fall may be due in part to the circumstance that recent decisions in the Courts have not been quite so favourable to the Edison interest as earlier judgments. On the other hand, it is possible to see in the drop an indication that the generally unprofitable character of the electrical supply industry throughout the States is being found out. There has been a tremendous growth of electric lighting and power schemes in North America during the last few years. But in most cases these were started by and in the interest of parent companies like the General Electric concern; and a collapse is certain to follow upon the discovery that very few of these ventures can ever be self-supporting.

The assertion that electric arc lighting is cheaper than gas for street purposes does not "go down" with all local authorities. The Strand District Board of Works have recently had under their consideration a tender of the Metropolitan Electric Light Company for lighting the Strand with arc lamps. The scheme contemplated the substitution for the existing 67 gas-lamps, costing £473 per annum, of 22 arc lamps at a total yearly cost of £1195, on the understanding that one-half the number would be extinguished at midnight. These being the terms, it is not surprising that the Works Committee "could not advise the Board to adopt the electric lighting until it became much cheaper." The price asked for the arc lamps in this instance is exorbitant, and suggests two interpretations of the electricians' intentions—either they do not want street lighting, or the progress of their industry must be in the backward direction; for street lamps of "2000-candle power" used to be offered years ago at a much lower cost.

The last general meeting of the shareholders of Messrs. Crompton and Co., Limited, does not furnish the most cheering reading to those who are interested in this concern, or in the electric supply trade generally. The Directors' report stated that, although the gross profits show an increase upon the figures of the preceding year, the net results are not so satisfactory. The unfavourable results are partly explained by referring to a mishap experienced by the Company in the middle of last winter, when the boilers used for the public lighting of Chelmsford, under the Company's contract with the Corporation, suddenly gave out, and temporary boiler plant had to be provided so as to keep the lighting going, at a cost of £2000, while a new set of permanent boilers was put in position. This catastrophe was glozed over at the meeting by the Chairman (Viscount Emlyn) and Mr. R. L. B. Crompton; the blame being put upon the "extreme badness of the water supply, which damaged the old boilers before the new ones could be placed in position." This excuse is hardly good enough, seeing that the firm have been in business in the same locality for some years, and the managers ought to know all about the nature of the water supply. It looks as if there had been neglect or carelessness somewhere. In any case, the electric lighting of Chelmsford, which was only undertaken by the Crompton Company for the sake of the advertisement will never repay them

that £2000. We may be mistaken, but we look upon this Crompton concern as being upon the "down grade;" and we should not be surprised at any moment to hear that the badness of trade, of which the Chairman complains, has taken an acute form. Viscount Emlyn tried to make a good deal out of the assertion that the Crompton arc lamp has been so improved that it is now the best and cheapest in the market; but arc lamps will never pay a dividend upon £300,000 of capital. The Company have been making a fuss lately about electrical cooking apparatus, as to which the same observation holds good. Altogether, we agree with the discontented shareholder who told the Board at the meeting that "the report was an unfortunate one in many ways;" and it cannot be said that the official apologists improved the look of matters. Unless there is a revival of their business, the Chelmsford firm will be compelled to reconsider their methods. The Chairman mentioned the fact of the stock-in-trade showing a considerable increase for the year as being a "satisfactory feature." But we imagine he would have awakened a more sympathetic response from the proprietors had he been able to say that everything was selling so fast that the Company could not keep any stock at all.

THE DAWN OF A NEW UNIONISM.

In recounting last week the tale of the "Triumph of Free Labour in Australia," we gave the conclusion to which the defeated Union leaders had arrived after their disastrous experiences at Broken Hill and elsewhere—that the strike period is over and done with, so far as the Australian working man is concerned. It is curious to read these observations at the present time, when the coal trade of a great part of the United Kingdom is actually being paralysed by one of the biggest strikes in the industrial history of the country. There is all the difference in the world, however, between the purely economic struggle now being waged by the coal miners of the Midlands and South Wales, and such political disputes as those which formed the subject of our last week's article. The latter were of the same order as the gas stokers' strikes of 1889 and the Hull dispute of this year, wherein employers and their men were fighting for the control of the means of production. The coal miners are, on the other hand, merely protesting against being paid a lower rate of wage than they think they deserve; and their *quondam* employers are quite content to remain passive while the protest runs its course. There is no question as to the relative positions of the different parties in regard to the industry.

An organic controversy such as that between the Australian employers and the Union workmen is not ended with the defeat of one side in a particular campaign. In the South Metropolitan example, this was recognized by the employers, who instituted their profit-sharing scheme with the object of removing the root of discontent which had borne the monstrous growth of the strike of 1889. In Australia, the necessity for reconstruction of the industrial system appears, from the account of the correspondent of *The Times*, to have first occurred to the workmen. The employers do not propose to do anything different from what has been done hitherto; and there is no reason why they should, for the circumstances of the country are not the same as the conditions obtaining in an old community. In Australia, every man who is suited for the country has a choice of two careers open to him—either to "settle," or work for those who have already settled. Up to the present time, the labouring population has shown a marked preference for concentration upon the towns, which means working for wages. Meanwhile, there is any amount of land waiting for profitable occupation. Unfortunately, to do this successfully involves the prior possession of certain qualities and advantages which are less common among labouring men than might be desired.

Whether his lot is fixed in Australia or at home, the average worker for wages is conscious of a lack of something; and it is upon this consciousness that the Socialist plays. The first expression of this feeling everywhere is a demand for higher wages. Then comes the desire for more leisure. It is not long before progress along this road, even when helped by the force of Trades Unionism, which is admittedly capable of rendering great assistance in these matters, is arrested by what appears to be insuperable economic obstacles. These the unionists prepare to deal with according to their lights; and their handiest weapon is that claim for the recognition of the principle of Unionism which has so disastrously failed them in so many instances. Do they give up the assault? Not at all, unless they are satisfied by the grant of some such concession as profit-sharing, which may or may not be of permanent validity for the purpose. In the absence of any such *via media*, the labour leaders in Australia, as at home, turn to politics for redress. Hence arise Independent Labour Parties, and similar combinations, the object of which is to utilize the numerical strength of the working-class vote by sending to Parliament and into all local governing bodies delegates charged with the duty of renewing in the political field the struggle on behalf of Unionism in which it has been beaten upon the industrial field. We have this movement in some force at home; but it is to Australia that we must look to see it in its strength, and operating under the most favourable conditions. Meanwhile, the beaten Union leaders are reorganizing their societies upon broader lines. The principal Unions have abolished entrance fees, and brought their subscriptions down to the lowest sum on which it is possible for the institutions to exist. Obstacles to entrance of every kind have been removed; and energetic attempts are being made to federate the Unions, and thus bring all labour under the central control of the trades and labour councils or trades halls. Every type of worker is to be brought within the same fold. As the reporter says, if such a scheme is to be prosecuted with any hope of success, it is evidently necessary that the sacrifices which are asked from unionists should be minimized, and the advantages attaching to the position should be increased. "Failure to attain their desired ends, which is all that the old unionists have to show as the results of a prolonged struggle, is not calculated to attract new disciples." Advocates of the new movement in Australia have accordingly gone very far beyond those principles which are known at home as those of the "New Unionism." They propose not only to drop the old fighting engine of the strike, and to leave off the unprofitable amusement of railing against "blacklegs," but also to devote themselves to practical methods of eliminating the latter element in the labouring population, by helping the unemployed to find work. Some of the Unions have taken power to employ their funds in aid of co-operative enterprise; and some small experimental beginnings have been made. Among other things, contracts have been taken for road making and railway work. Apart from all other considerations, it is obvious that such experiments need the accumulation of capital, which in its turn will depend on the observance of the resolution arrived at to avoid strikes. "Strikes, in the language of the New Unionism, do not make work. They leave the great question of the unemployed untouched, and the unemployed form the real dead-weight which the labour market has to lift. If the money spent by the labour party upon the late strikes had been invested in co-operative land settlement, there would have been, the new unionists point out, little depression and no labour difficulty in Australia to-day. To replace competition by co-operation is the moral basis upon which the movement proposes to work."

This is a most interesting passage in an engrossing tale. In propounding this principle, the men of the new movement foreshadow the first real advance that has been indicated from the unionist side upon the old Union doctrines. Co-operative production is a worthy rejoinder to the employers' suggestion of profit-sharing. Neither in Australia nor elsewhere is there any good to be done to the cause of labour by abusing the capitalist, or doing away with him. The most promising aim is to increase both capital and the number of capitalists. The more capital there is in the world, the better it is for everybody, and the more its increase is checked, the worse it is for the working man in particular. "What the Socialist reformer has to aim at is not the repression of the capitalist or the removal of any incentive to exertion that now exists. His real business is to make capitalists of those who at present have nothing; and he can do this only by making individual property secure for all alike, and teaching men to look to industry, efficiency, and sobriety for their enrolment in the ranks of capitalists." The great question is, to what extent the average lot can be improved by these means. There is no Socialism, no Independent Labour politics, in telling a man to be industrious, efficient, and sober. There is plenty of evidence that might be adduced to prove that simply to follow the instincts of morality, and to lead a life of industry, sobriety, and thrift, is not enough, since these qualities do not save the labouring poor from ending their days too frequently in the workhouse. What shall the workman do to be saved? Unite? Yes; but for what purpose, now he has learnt that it is in vain to attempt the obliteration of the dividing-line separating the status of the employer from that of the employed?

Here, unfortunately, the ignorance of the labouring man puts him upon a false scent. He wants to have a Party, to fill legislatures, and to have the power of making laws to suit himself. He does not propose, like poor Jack Cade, to enact that the "pint pot shall hold [a quart," but he wants to prevent the executive from interfering in labour disputes—that is, quelling strike riots—and to make it felony to work more than eight hours a day. He also wants to "nationalize" land and industries, to start State workshops, to penalize all incomes over £300 a year, to abolish bankers, to forbid the payment of interest on money lent—indeed, there is no end to the absurdities promulgated in the name of the Social Democracy. What the political Trade Unionists appear to chiefly need is a reminder that all this is putting the cart before the horse. They seek political power in order to effect a host of vast economic changes. "There is no political power in this world, and there never will be one, capable of doing anything of the kind. Political movements are not the cause, but the outward sign and expression, of economical ones." The most useful and fruitful legislation is that which removes disabilities of proved harmfulness to new and rising interests. Legislation which goes beyond the facts of every-day life and the desires of the majority of mankind usually becomes a dead letter. Socialistic commonplaces remain the same all the world over; and the balderdash of a Marx, "made in Germany," is by that singularly unpractical person, the Trade Union agitator, forced

to do duty in the newest as well as in the oldest communities, regardless of circumstances. Consequently, as the correspondent of *The Times* states, there is nothing new in Australian Socialism, which draws its principles wholly from European sources.

One of the most valuable passages, certainly, in the series of letters to *The Times* upon Australian topics to which we are indebted for the subject-matter of this and our last week's article deals with the vexed question of the "unearned increment," which Socialists everywhere declare should be secured for the community. There is a speciousness about this proposition, as applied to landed property, which entraps the casual observer; and we are grateful for this aid to a right understanding of the principle involved. Shortly worded, the proposition means that, though a man shall not be taxed for his own improvements, he shall be taxed for the improvement of his property which is due to his neighbours. "One cannot imagine," says the writer, "that there is anything new left to say upon so old a topic as the unearned increment. Yet, hearing the iniquity of enjoying it so glibly and so constantly inveighed against, it is impossible to help wondering whether the advocates of the tax which is to secure the value of it for the community have ever realized that unearned increment is nothing but the mutual give-and-take of civilized communities, and exists no less in the greater purchasing powers of their own wages and the many luxuries and advantages brought within their grasp by the exertions of others, than it does in the increased value of land near which a town has sprung up." This is a distinctly luminous statement, which we do not remember to have encountered in all the voluminous literature of the subject that has appeared of ate years. The doctrine is illustrated by reference to the one article of tea. Fifty years ago, the value of a pound of tea was a guinea. Now it costs 2s. There is hardly a household in Australia (or England, for that matter) which consumes less than 2 lbs. of tea a month. It is true that fifty years ago this would not have been the case. None the less is it true that, in the very fact that he consumes it, the householder of to-day enjoys, as compared with his own grandfather, an unearned increment of something over twenty guineas a year upon one article of diet. This has not come to him in any way through his own exertions, but through the outlay of capital in tea-planting and shipping companies, which have increased production and lessened the cost of carriage. It is the gift of the community to the individual consumer. The same argument applies to his clothes, to his light, to his food, to his better house, to his cheaper literature, to almost every article which he uses in daily life. "The increase and cheapening of these commodities is the unearned increment of labour, and results very largely from the employment of capital." This is an extremely neat summing-up of the popular fallacy, which trenches upon gas prices and dividends as well as upon land values. As a contribution to the literature of labour and political economy, these "Letters from Australia" to our daily contemporary contain much more than would be suspected from their title, and ought to be placed upon the table of every Mechanics' Institute and Working Men's Club in the land.

NEWSPAPER WRITERS AND WATER QUESTIONS.

THE "sweet reasonableness" of the average newspaper writer when he lays hold of the subject and conditions of water supply, is a thing to excite the admiration of gods and men. The *Morning*, in a recent article on this question, has shown conscientious regard for custom and tradition. Its screed on "another of those water cases which are the scandal of London government" rises to the full height of precedent, and does complete and consistent justice to the accepted precepts of the newspaper editors. Commenting with genuine or well-simulated indignation on the circumstance that somebody whose water supply had been cut off could obtain no redress from the Magistrate at Westminster, the writer observes that of course the application was ineffectual, "as the water monopolists are hedged in by their Acts of Parliament at all points." This "of course" is the merest moonshine. The Companies, whose sin and shame it is to successfully administer vast undertakings, the wise management of which is essential to the well-being of millions of the Queen's subjects, are not hedged in at all points. They are protected, undoubtedly, in certain essential particulars; but they are also laid open to extremely onerous statutory requirements, and are called upon to fulfil the most important obligations towards the public. It is true that the law does not compel them to give consumers a gratuitous water supply; but it would almost seem as if nothing short of that would quench the fiery criticism of the Press.

On the whole, when it is remembered how often virulent abuse is heaped upon the Companies, the newspapers may well congratulate themselves on the present state of the law in regard to libel. The case which recently came before Lord Chief Justice Coleridge at the Yorkshire Summer Assizes, as reported in the JOURNAL for the 1st inst., serves to illustrate the legal position in this respect. In that instance the Heckmondwike Gas Company and its Directors were the plaintiffs in an action for slander; and the defendant's Counsel raised the point that, as to the Company, there was no right of action. A Company, he urged, could not, as such, commit a crime, and, therefore, could not be defamed. Such, we believe, is the law. The proposition was laid down many years ago by Chief Baron Pollock, and followed more recently by Justices Day and Lawrance in a libel action brought by the Corporation of Manchester. Briefly, a corporation—and, of course, a company is a corporation in the eyes of the law—cannot sue for a libel merely affecting reputation, though it is said to have a right of action where the libel affects its property. The newspaper critics and the platform orators may, therefore, rejoice in their freedom. They are at liberty, in the interests of truth or of fiction, to blacken the character of the Water Companies, to impute to them dishonesty, inhumanity, turpitude of all sorts and of the deepest dye, without any uncomfortable risk of being called upon to prove their words or pay for them. The Companies must bear all things, and receive rebuke with meekness; for the law gives them no manner of remedy. This may be in the interests of public policy, or it may not. But, at any rate, there it is.

It is well to bear all this in mind, because, liberal as have been the outpourings of newspaper abuse in the past, coming events in respect of the great question of water supply will assuredly bring with them renewed and equally unreasonable attacks on the part of jaundiced journalists, and writers who like nothing so well as to get hold of a topic upon which they can safely pound away without any sort of editorial let or hindrance. Meanwhile, a word more to the indignant writer of the article in the *Morning*. Having opened attack upon the Water Companies with the usual amount of fire and fury, it appears to have dawned upon him gradually that there may possibly be something to be said for the enforcement of the rights without which, in truth, no system of water supply could possibly be carried on. We are not here concerned with the particular case which is taken as the text for his leader. Let it be granted that hard cases—that is, cases hard upon someone—must inevitably occur from time to time. It is the general tendency to "go" blindly for the Companies that we now, as on previous occasions, deem it right to expose and condemn.

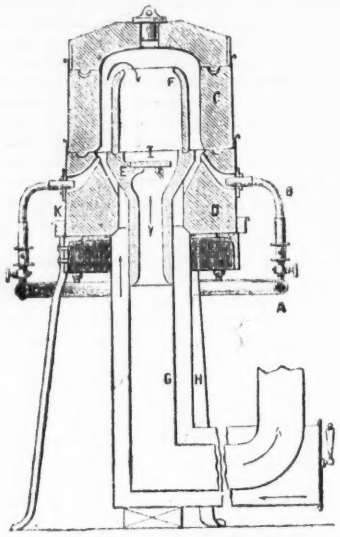
If anyone can make a practical suggestion for mitigating the inconvenience and danger arising from a discontinuance of water supply in isolated cases, it would deserve, and receive, favourable consideration. But what will the ratepayers say to the proposal put forward by the *Morning?* "Why not," says our contemporary, "erect public fountains in every street, where every person unable or unwilling to pay the Water Companies charges for a domestic supply might draw all the water he required?" Why not, indeed? Prodigious! Never has so admirable a scheme been devised in the interests of sanitation. Such a system would certainly have the entire approval of the landlords of rookeries and slums. They, and a good many others, are always unwilling, if not unable, to pay the Companies' charges. Then, too, the picturesqueness of the constant procession to the fountain in every street would doubtless be appreciated by those who do business in great thoroughfares. It is fair to the *Morning* to state that the Companies are not invited to inaugurate the public fountain supply in every street gratuitously. The writer does not go quite so far as that; but he would authorize a charge upon the rates—more rates!—to cover the expense of carrying this splendid notion into effect. Finally, having begun with the ridiculous, and dropped into the impossible, the author of the idea himself lapses into doubt. "The scheme is by no means a perfect one," he concludes sadly. Here, at least, we feel constrained to agree with him. On the whole, perhaps, he will do well to hold over the suggestion until the London County Council have attained their ambition, and entered into possession of Naboth's vineyard. Then, doubtless, we shall be within measurable distance of the millennium.

Gas v. Electricity for the Lighting of Railway Stations.—The defective illumination of railway stations is referred to in a "Note" in the current number of the *Builder*. It seems that, owing to the inadequate lighting of the Midland Railway Company's station at Swansea, an architect sustained injuries for which he was successful in recovering damages from the Company. At this result our contemporary is naturally gratified—not because the plaintiff was an architect, but because "railway companies light many of their stations very imperfectly." The writer does not go so far as to openly condemn gas, and plead for the use of the electric light solely; but he thinks "the lamps might be better constructed, have reflectors to throw the light down, and be more powerful." He adds that the fact that there are not more persons injured at railway stations is to be attributed rather to their own caution than to the good lighting provided by the companies. The writer of a letter in the *St. James's Gazette*, into which the *Builder* remarks were copied, appears to think, however, there was an implied preference for the electric light; and he puts in a word for gas. Taking the Metropolitan Railway, he states that it is a matter of general complaint that the two stations which are the worst lighted on the line are the Royal Oak and Westbourne Park, at both of which electricity is employed. He says that the small electric current which, at the former station, "serves to make the darkness darker," furnishes about one-twelfth of the light of the large gas-burners at Baker Street.

NOTES.

A Regenerative Laboratory Furnace.

M. Bigot has contributed to the *Moniteur Scientifique* a description of the experimental gas-furnace of which the design is shown in the accompanying illustration. It is regenerative, and



gives a temperature which can be pushed beyond the heat of porcelain baking, in an atmosphere that can be rendered oxidizing or reducing at will. The furnace is an improvement upon that of M. Seeger, Manager of the Berlin Porcelain Works. The gas enters from the supply-pipe A sideways into the furnace by a series of atmospheric burners B, each fitted with a cock. The flame passes between the casing C and the moveable screen F; descending by the central flue G, which is connected with a chimney having a good draught. This flue is surrounded by an annular one H, fitted at the outside with an air inlet capable of regulation. The air which passes in is heated by contact with the central flue, and finally enters the furnace through holes at E, where it meets the gas at the point of ignition. All the joints of the casing from the base K to the cover, are sealed with sand. The furnace is built up of moveable pieces, easily replaceable; and it is enclosed in a stout metallic jacket. The consumption of gas is comparatively trifling; and according as the volume of entering air is large or small, so the flame is made oxidizing or reducing. The crucible containing the material to be operated upon stands on the bracket-plate I. After two hours' heating, the temperature is high enough to bake the new Sèvres porcelain paste. After three hours, the temperature will bake Sèvres hard paste or Limoges porcelain; and even this is not the limit. M. Bigot remarks that not until the production of this appliance has it been possible to attain such high temperatures in a laboratory apparatus, without the aid of an air-blast.

The Source of the Oxygen in Air.

Dr. T. L. Phipson, whose speculations concerning the state of the earth's atmosphere during the coal period have been mentioned before in these columns, has contributed to the *Chemical News* a statement, which he probably intends to be conclusive, respecting the way in which oxygen appeared in the atmosphere after the period in question. Dr. Phipson has exposed plants in atmospheres of carbonic acid and of hydrogen and found that they were not killed. In the next place, he exposed them in pure nitrogen, and in a mixture of nitrogen and carbonic acid. In both cases, vegetation was remarkably healthy, and even luxuriant, for a lengthened period. To give the results of these observations in as few words as possible, Dr. Phipson states that the plant absorbs carbonic acid by the roots, and secretes oxygen by the leaves; so that after awhile the nitrogen atmosphere contains a certain quantity of oxygen and in time it would, no doubt, approach to the composition of ordinary atmospheric air. Going back to the primitive ages of the globe, he declares that there was probably a period when the heat was so intense that no compounds could exist. As the temperature fell, all kinds of compounds were formed according to the laws of affinity, until finally there remained surrounding the solidified surface of the earth an atmosphere of the inert nitrogen—a substance which is known to have little or no tendency to combine directly with other substances. That there was no oxygen in this ancient atmosphere is evident, according to Koene, from the presence of various oxidizable substances in the primitive rocks. It is into this primitive atmosphere of nitrogen that plants have poured oxygen for countless myriads of years, until it has arrived at its present composition. There was doubtless more carbonic acid in the atmosphere of the earth during the coal period, due to the abundance of volcanic action; but it is not necessary to refer the exuberance of the vegetation of that particular era to the presence of this gas, because vegetation of certain orders is able to flourish luxuriantly in nitrogen alone.

The Transparency of Ebonite to Light and Heat.

Signor Riccardo Arno has communicated to the Turin Academy of Sciences certain results obtained by him in the course of an investigation on the action of heat-rays of various lengths upon thin plates of ebonite. He used six different sources of light, the radiations from which were sent through plates of ebonite of thicknesses varying from 0·12 to 0·52 millimetre. The thinnest plates absorbed 25 per cent. of the heat radiated from an incandescent lamp, the luminous heat-rays of which were cut off by a thick plate of glass. When the source of light was very bright, this ebonite film was found to transmit a small portion of the visible red rays. The thinnest film absorbed 69 per cent. of the dark rays from the smoked surface of a Leslie cube containing boiling water, while the thicker plates absorbed 88 per cent. of them; thus showing that ebonite is less transparent for dark rays of heat of low refrangibility than for those more nearly approaching the visible spectrum. The greatest transparency was shown in respect of the dark heat-rays on the border of the luminous spectrum. The successive substitution of a hot iron plate, a glowing platinum wire, a Locatellis (gas) lamp, and an incandescent electric lamp for the Leslie cube, was followed by a steady increase of transmitting power in all the specimens of ebonite. These observations may be studied in connection with Tesla's experiments with high-frequency phenomena, which go to indicate that the transparency of media is largely a question of conditions.

Mr. William Yeats Baker has been elected a Director of the West Kent Gas Company, to fill the vacancy caused by the death of Mr. Walter Greenberry, which was noticed in the JOURNAL for the 1st inst. The new Director, from his connection with the Thames Bank Iron Company, is well known to many gentlemen connected with the gas industry.

Pacific Coast Gas Association.—The members of this newly-formed Association had their first meeting on the 11th and 12th of July, at the offices of the San Francisco Gas Company. The President of that Company (Mr. J. B. Crockett) was elected President, Mr. J. L. Hallett, of Portland, Vice-President; Mr. J. A. Britton, of the Oakland Gas Company, was chosen as Secretary and Treasurer; and the third Tuesday and Wednesday in July were fixed for the annual meeting. The names of 54 gentlemen were upon the roll. Two papers were read—one by the President, setting forth the benefits to be derived from the formation of a Gas Managers' Association on the Pacific Coast; and the other by Mr. J. L. Hallett, entitled: "Is the Electric Light Friend or Foe to the Interests of Gas Lighting?" The latter led to a discussion; and the contents of the "Question Box" elicited some useful information.

The Late Mr. Lewis Thompson and the Gas Industry.—Many of our readers may remember that the late Mr. Lewis Thompson left a sum of £15,000 in relief of the poor-rate at Byker, Newcastle, on condition that the Guardians of the Poor placed every year, on the 17th of August (this being the anniversary of the death of a beloved sister), a wreath on his father's grave in Jesmond Old Cemetery. The ceremony was duly performed last Thursday; and it calls for notice here from the fact that Mr. W. J. Warner, of South Shields, was present, and was invited, as a personal friend of Mr. Thompson, to make a few remarks. Mr. Warner said he remembered how, at the outset of life, the deceased had spoken to him many words of a stimulating kind, which he believed had left their influence upon him. He did not think it was generally known how much Lewis Thompson had done for the improvement of gas manufacture. He was the first man who placed the art of gas lighting upon a scientific basis. He went into the gas world at a very stormy period. There was at that time a great agitation in London and the provinces, in which many persons contended for their own private interests; and at that period Lewis Thompson became connected with the JOURNAL OF GAS LIGHTING. It was through the columns of that paper, he entered into the controversy that was going on, and showed that the only thing to consider in discussing the price of coal gas was the question of standard. He laid the basis of the present standard in testing gas; and the improvements that had followed in the gas world were largely due to him. If this had been the only work Mr. Thompson had done, he would have been worthy of honour. But he also wrote "The Chemistry of Gas Lighting," which had lately been pronounced by a high authority to be the standard work on the subject up to now. Mr. Warner stated that he had been invited to be present by Mr. J. I. Nicholson, of Heaton, and that he felt it an honour to be there. He thought, however, it would be well if Mr. Nicholson and his friends could induce the North of England Gas Managers' Association to arrange for their annual meeting to fall on the 17th of August, in order that they might be present to take part in the ceremony. By coming there to honour Lewis Thompson, they would honour themselves, and would make the public better acquainted with the distinguished man who had made the bequest. The suggestion was received with approval. It may be mentioned that a tablet is shortly to be fixed in the cemetery, recording all the facts connected with the gift.

COMMUNICATED ARTICLE.

ON THE HEAT-VALUE (CALORIMETRICALLY DETERMINED) OF LIGHTING GAS.

By B. H. Thwaite, Assoc.M.Inst.C.E.

In his articles on "Luminous and Non-Luminous Combustion," contributed to the JOURNAL about two years ago,* the author laid down the following proposition: The greater the molecular concentration or density of the constitution of a given hydrocarbon, the greater the degree of luminous intensity." He further demonstrated the truth of this proposition by means of a graphic diagram, showing conspicuously that the thermo-luminous efficiency of a hydrocarbon increased *pari passu* with its increased density; the gradations of efficiency being singularly regular.

The truth of the proposition has been further and abundantly confirmed by calorimetric determinations, made by an eminent French engineer and *savant*, M. Aguitton, of the Marseilles Gas-Works, at the suggestion of the author's friend M. Pierre Mahler, of the Ecole des Mines, Paris. The author suggested, in the pages of the JOURNAL, that these determinations should be made; and after the description which he gave at the meeting of the Incorporated Gas Institute on June 16, 1892, the late Mr. W. Foster, M.A., agreed to conduct them when an opportunity presented itself. The author thereupon obtained for him the promise of the loan of a Berthelot-Mahler calorimeter for the purpose of testing the comparative heat-values of gases of varying photometric richness. This Mr. Foster was never able to do; and now, unhappily, he is beyond the bar that divides active life from the rigid inertness of death.

After the description of the Berthelot-Mahler calorimeter at the meeting of The Gas Institute, the author suggested that, owing to the close degree of accuracy with which the determinations could be made, the luminous value could be deduced from the calorimetric one; and he further urged that eventually the calorimeter might become a more important instrument to the gas engineer than the photometer, because the elements of uncertainty were far less, and the results were far more close to refined accuracy. Mr. W. A. Valon dissented from this view. The author, however, still adheres to the opinion; and he is confirmed in his views by those of M. Aguitton, to whom the engineering world is indebted for the valuable determinations which the author is enabled to give, and which have recently been presented to the Académie des Sciences.

M. Aguitton has calorimetrically determined the value of illuminating gas varying from 1 candle to 15 candles (International Standard). The calorimeter used was that originally devised by M. Berthelot, and described in his great work entitled "Essais de Mécanique Chimique," but modified and much simplified by M. Pierre Mahler. This beautiful instrument the author has already introduced to the gas world (*vide* Transactions of The Incorporated Gas Institute for 1892). The calorimetric values were reduced to one standard of 1 cubic metre, at 15° C. and 760 mm. of pressure in a dry state. The vapour of water is assumed to be condensed at constant volume. The illuminating power was determined by means of the standard photometer of Dumas and Regnault. The determination was effected in two ways—either by the consumption of x litres of gas corresponding to the light of one Carcel-hour, or by decimally graduated candles as fixed by the International Congress. The value of one Carcel being taken at 9·60 decimally graduated candles, the lighting power corresponding to the calorimetric values is the intensity in decimally graduated candles produced by the consumption of 100 litres of gas burnt in one hour.

The results of a hundred tests, with gases of varying luminous or photometric richness, have been graphically laid out; and from these determinations (in which the ordinates represent the calorimetric values or heats of combustion, and the abscissæ represent the intensity in candles) a formula has been deduced by M. Aguitton, which the author has arranged as follows:—

Let x = photometric value (in candles decimally graduated).
C = the calorific value deduced from the calorimetric determinations.
d = a coefficient 352·6.
e = a coefficient 2280.
Then $C = x \times d + e$.
Transposing, then—

$$x = \frac{C - e}{d}$$

To test the formula, and referring to the table, let us calculate the photometric value equivalent to a calorific one, determined by the Berthelot-Mahler calorimeter. Taking a gas having a heat-value of 7040 calories per 100 cubic metres, then—

$$x = \frac{C - e}{d} \text{ or } x = \frac{7040 - 2280}{352{\cdot}6} = 13{\cdot}4997 \text{ or (say) } 13{\cdot}5 \text{ candles.}$$

It will be seen from the figures in the table below that the lighting value can be determined to a close fraction; the accuracy not depending upon the ocular judgment, or the manipulative skill of the investigator, as in the case of photometric measurement, where the elements of uncertainty are both numerous and variable, and have been the *bête noire* of gas engineering experts for many years.

In the use of the Berthelot-Mahler calorimeter, M. Aguitton has found the instrument to be remarkable in the rigorous exactitude of its results, and in the simplicity of the manipulations necessary to work it, when once well understood. The accompanying graphic diagram which the author has prepared shows most conspicuously that the thermo-luminous efficiency, or the degree of light for a given heat-value of gas, is far greater for the richer hydrocarbon gases than for the poorer ones; so that the richer the candle power of the gas, the more economic it is in its expenditure of the original heat-assets of the gas.

Photometric Value according to Standard fixed by International Congress, 1889. Consumption, 100 Litres of Gas burnt in Bengel Burner.		Heat of Combustion, in Calories, of 1 Cubic Metre of Gas at 15° C. and 760 mm. Pressure.
5·00	..	4043
5·50	..	4219
6·00	..	4395
6·50	..	4572
7·00	..	4748
7·50	..	4924
8·00	..	5101
8·50	..	5277
9·00	..	5453
9·14	..	5503
9·60	..	5665
10·00	..	5806
10·50	..	5982
11·00	..	6158
11·50	..	6335
12·00	..	6511
12·50	..	6687
13·00	..	6864
13·50	..	7040
14·00	..	7216
14·50	..	7392
15·00	..	7569

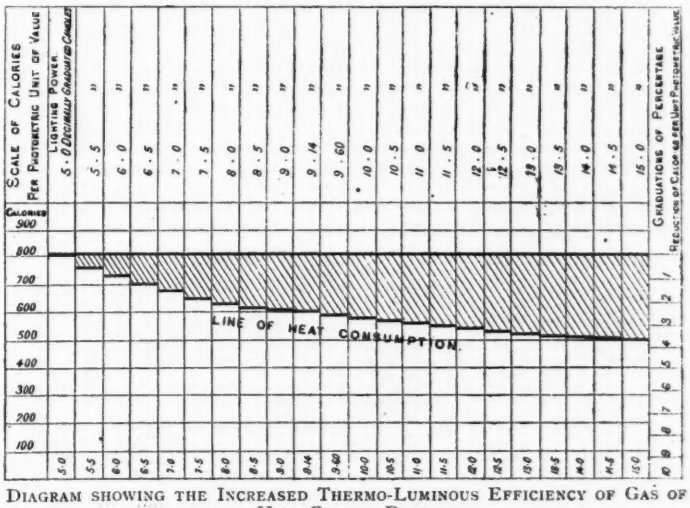


DIAGRAM SHOWING THE INCREASED THERMO-LUMINOUS EFFICIENCY OF GAS OF HIGH-CANDLE POWER.

Mr. William Stansfield, the Manager of the Knaresborough Local Board Gas-Works, has been appointed to a similar post under the Hebden Bridge Gas Company.

Resignation of Mr. Alderman Priestman.—The Chairman of the Gas and Electricity Supply Committee of the Bradford Corporation (Mr. Alderman F. Priestman) has announced his intention of resigning his position in November next.

Association of Sanitary Inspectors.—By invitation of the Municipality, the above-named Association have held their summer conference this year in Glasgow. The proceedings opened last Thursday, in the Corporation Galleries, under the presidency of Mr. Crawford, the Convener of the Health Committee. The President (Sir B. W. Richardson) was unable to be present; but his Inaugural Address was read by the City Chamberlain. Sir Benjamin reviewed the position of sanitation, and touched on the work that lay before the members in the continuance of their sanitary labours, with special reference to inspection. Sanitation was now, he said, the leading topic of the day; and if the popular feeling were judiciously cultivated, the results would have in the end an importance which few now realized. But intended reforms, to be safe, must be gradual, must be founded on actual knowledge, and must be understood by the masses. He had no doubt the country was much healthier, in mind as well as in body, from the efforts of sanitary reformers during the past half century. He attributed this not so much to legislation as to education; and the prospect of advance lay in enlightening the masses rather than in attempting to force them by vehement measures into the protection of life.

* See Vol. LVI., p. 1238; Vol. LVII., pp. 154, 446, 742; and Vol. LVIII., p. 205.

TECHNICAL RECORD.

NORTH OF IRELAND ASSOCIATION OF GAS MANAGERS.

The Papers and Discussions at the Coleraine Meeting.

In continuation of our report, commenced last week, of the proceedings at the above meeting, we give the two papers read, with the remarks made thereon.

Mr. C. B. Outon (Inchicore, Dublin) read the following paper:—

DESCRIPTION OF A NEW OIL-GAS WORKS ERECTED AT THE INCHICORE WORKS, DUBLIN.

It has occurred to the writer that a description of a recently-erected oil-gas works may possess some few points of interest to those members of the Association who do not happen to have had any practice in this particular branch of gas manufacture, as applied to railway-carriage lighting.

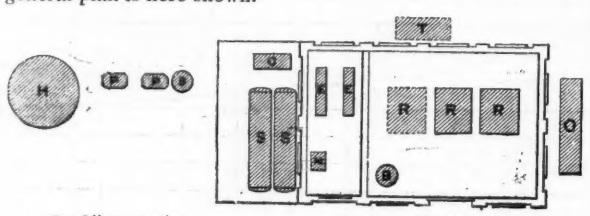
Although the oil-gas system has been in general use on many railways in Great Britain, it has only been introduced, up to the present, on three Irish lines. It need hardly be stated that the new plant is intended to supersede the present system of lighting produced by the indifferent mineral-oil lamps, and also their attendant heavy cost of renewals, breaking of glass bowls, and irregularity of burning. Bearing in mind the great improvements made in Irish rolling-stock in recent years, it is somewhat surprising to find that the lighting arrangements are still so much behind the times.

Like other gas undertakings, oil gas has a competitor in the electric light; and it is a significant fact that, after several years' trial on two or three English railways, the latter has been displaced in favour of oil gas. It may be inferred that the system of charging accumulators from a stationary dynamo, or charging them from a dynamo situated in the guard's van, driven direct from one of the axles, is far from being economical or satisfactory, except perhaps under certain conditions.

Coal gas is still being employed on a very few lines, notably on the North London Railway, where the recent introduction of a new regenerative lamp gives a light amply sufficient for all reading purposes, and is a great improvement on the old lamps fitted with flat-flame burners. The use of coal gas, however, is restricted to short journeys, owing to the larger storeage room required, and the necessity for frequent charging. This question of storeage forces itself upon the attention of the carriage designer, who has to bear in mind that a large portion of the available space below the carriage under-frame is already occupied by various brake reservoirs, rods, and other gear. It is chiefly due to the high illuminating power of oil gas, with consequent small consumption per burner, that its employment has become so general, and also to the fact that it may be readily compressed to 150 or 160 lbs. pressure, without any very great decrease of luminosity.

Cannel gas has been occasionally employed, and, no doubt, would form an efficient alternative; but the present enhanced price of this coal somewhat prohibits its use.

The oil-gas plant completed at the Inchicore Works, Dublin, for the use of the Great Southern and Western Railway, has been erected under the general superintendence of Mr. H. A. Ivatt, the Locomotive Engineer. It may be premised that this plant resembles, in many respects, those already in full work in England; but, in point of compactness of arrangement and combination, it presents a few new features which may prove interesting to those accustomed to similar undertakings. A general plan is here shown.



O	Oil reservoir.	H	Small holder.
R	Retort-benches.	E	Compressing engines.
C	Condenser.	S	Store holders.
P	Purifiers; *s* Scrubber.	B	Vertical boiler
M	Station meter.	T	Tar-tank.

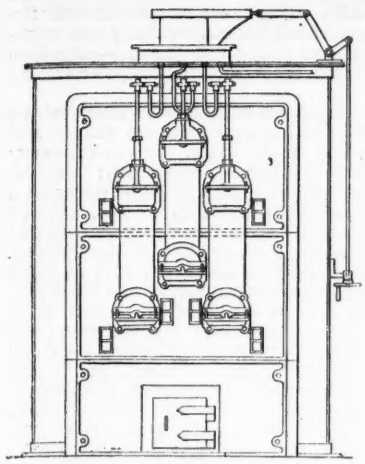
The oil, or "gas oil," as it is termed (which is supplied by the Pumpherston Oil Company), is stored in a tank, holding 2000 gallons. It is a mixture of paraffins and olefines (having a specific gravity of ·840 to ·850, and a flash-point of 220° Fahr.); and it is obtained by the distillation of shale. The oil is elevated by means of an ordinary force-pump into a small tank, from which it gravitates to three supply-cocks over each bench. The retort-house and engine-room form a substantially-built brick building. The former is about 32 feet by 27 feet, and contains two benches of retorts (with provision for a third), and also a vertical boiler. Each bench is encased around its two sides and top by ¼-inch wrought-iron plates, and forms a rectangular block 8 ft. 8 in. high, 6 ft. 7 in. wide, and 7 ft. 8 in. long. The front and back plates are of cast iron, and are easily removed when repair or renewal of retorts is needed. Each bench contains six 8-inch by 8-inch ⏀ cast-iron through retorts, working in three vertical pairs; and these are heated by one furnace. The setting resembles that employed on the London and North-Western Railway, but differs from the general practice in the majority of oil-gas works, where each pair of retorts is heated by an independent furnace. The retorts at Inchicore are 8 ft. 1 in. long over all, and are flanged at both ends. Each of the three upper ones contains a length of 2-inch gas-pipe, running from the front to within 6 inches of the back. The oil in flowing along these tubes is gradually raised to its boiling-point and vaporized; and the vapour returns along the upper retorts to the three lower ones, where it is completely gasified by passing through the latter, which are maintained at a temperature of about 1400° to 1500° Fahr. Each pair of retorts is connected in front by a rectangular pocket. The outlets of both the lower retorts are provided, at the back, with three testing-cocks; and these are opened, at intervals, for the purpose of estimating the quality of the gas being produced.

The issuing gas should be of a pale straw colour, which is an indication that the proper quantity of oil is being admitted. If an excess of oil is allowed to enter, it cools the retorts, and produces a lighter coloured gas, easily condensed. On the other hand, a deficiency in the supply causes the gas to be over-heated; and this is indicated by the issuing gas having a much darker tint, due to some of the carbon separating out in the form of fine soot. A small amount of carbon is removed from the retorts about every alternate day. The mouthpiece lids are luted with painter's putty. The quantity of gas produced from the bench just described is nearly 1100 cubic feet per hour. The economy of fuel effected by the larger bench will be apparent to those accustomed to the working of a furnace to each pair of retorts. No trouble whatever has been experienced by irregular expansion.

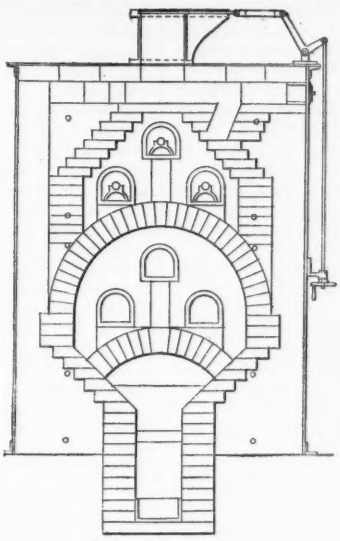
The impure gas is conveyed from the retorts, by means of three descension-pipes, to the hydraulic main situated on the floor-level at the back of each bench. A small quantity of water is allowed to constantly trickle through the hydraulic main, which effectually prevents the thickening of the tar—apt to occur at this stage. The gas then slowly passes through two condensers (which contain several perforated iron plates) situated on each side of the hydraulic main. The more viscid tar is here removed; and the plates are cleaned at intervals through suitable doors. The gas then passes through a 6-inch main to an ordinary set of 6-inch pipe condensers; and afterwards through a vertical coke scrubber and two small purifiers, charged with lime and sawdust. It is then conveyed to the meter, located in the engine-room; and, finally, to the gasholder. The latter, by reason of its being a temporary receptacle, has only a capacity equal to about one hour's make. The scrubber has a moveable top with water luting, for the easy introduction of coke, and may be readily bye-passed by a four-way valve. Two similar valves at the purifiers enable them to be worked in any desired order; and their contents remove the small amount of sulphuretted hydrogen and carbonic acid contained in the gas. Many oil-gas works dispense with this part of the purification. Suitably sealed drain-pipes convey the tar away from the hydraulic main, condensers, and scrubber to a large tank embedded in the ground. About 4 gallons of tar are produced per 1000 cubic feet of gas made. During the short time the works have been in use, the make of gas per gallon of oil has been found to be from 72 to 75 cubic feet, of 40-candle power.

The engine-room next the retort-house is 10 ft. 6 in. by 27 ft., and contains two compressing-engines. The diameter of the steam cylinders is 9 inches, and that of the double-acting compressing-pumps is 6 inches. The cylinders and pumps are arranged tandem fashion, and have a stroke of 13 inches. The steam is obtained from a vertical boiler of about 8-horse power, situated in a corner of the retort-house, and is supplied at a pressure of 70 lbs. to 80 lbs. Each engine, when making about 50 revolutions per minute, compresses about 1200 cubic feet of gas per hour. The delivery-pipes are connected to storeage reservoirs, each having an inside diameter of 4 ft. 1 in. and a length of 18 ft. 6 in. They are made from ½-inch iron plates, welded throughout, and form excellent examples of good workmanship. Each is charged to a maximum pressure of 150 lbs. per square inch, and at this pressure contains 2200 cubic feet of gas. They are provided with suitable inlet and outlet valves, with pressure-gauges, and also draw-off cocks for the removal at intervals, of a very volatile and pungent hydrocarbon, which condenses out of the gas on compression. About 1 gallon of this is produced per 1000 cubic feet of gas compressed; and its deposit causes a slight loss in illuminating value.

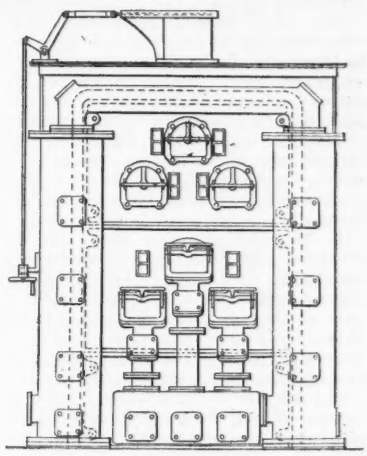
Owing to the works being situated some two miles from the terminal station at Kingsbridge, where the carriages have to be charged, it is necessary to convey the gas at full pressure along this distance. The medium used is a Perkins high-pressure wrought-iron pipe, with a bore of $\frac{7}{8}$ inch. It is run in 14-feet to 16-feet lengths; and the joints are formed by means of the usual coupling with right and left hand threads, the end of one pipe being coned to a sharp edge where it abuts against the next pipe. [Specimen shown.] The pipe is laid in a creosoted wooden trough, having a section of an equilateral triangle of 6½ inches side; and it was tested by hydraulic pressure, to 200 lbs. per square inch, previous to being covered with a mixture of boiled tar and pitch. The trough is also utilized for the conveyance of a telephone wire, connecting the gas-works and terminal station; the pipe itself forming an excellent return



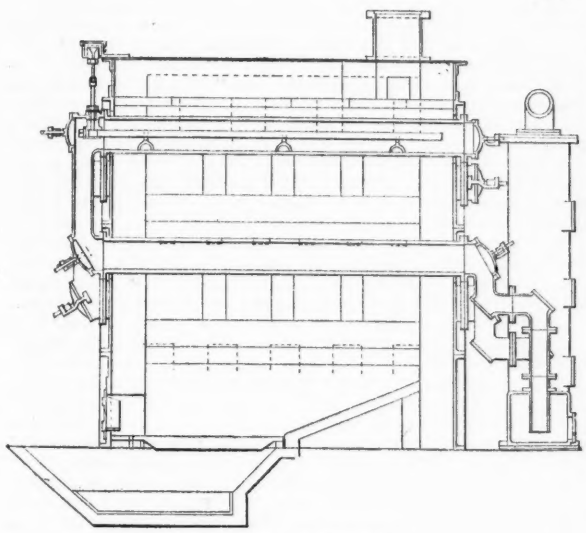
FRONT ELEVATION.



CROSS SECTION.



BACK ELEVATION.



LONGITUDINAL SECTION.

"earth." Two additional reservoirs are placed about ¼ mile from the terminus; and from these the gas is led to filling-pots situated, at convenient intervals, alongside the arrival platform.

The carriages are charged in the usual manner from these filling-pots by means of high-pressure flexible hose. Each vehicle is provided with two cylindrical reservoirs, which are connected—each being 17¼ inches inside diameter and 5 feet long. These reservoirs are made from sheet steel of No. 18 standard wire gauge, with brazed joints and dished ends, and are charged to a maximum pressure of 105 lbs. (or seven atmospheres) per square inch. The time taken in "gassing" a coach is about three minutes. A filling-valve and pressure-gauge are provided at each side of the carriage, to enable the charging to be performed from either side.

With a view of ascertaining the ultimate bursting pressure of these reservoirs, an experiment was recently made by subjecting one, selected haphazard, to hydraulic pressure. Rupture took place at 525 lbs. per square inch, which gives a very fair factor of safety. The rent was longitudinal; and, strange to say, the metal plate gave way, while the joint remained intact.

The gas passes from the reservoirs to the burners through a regulator, which reduces the pressure to 10-10ths on the outlet; and the main supply is carried up to the roof at one end of each vehicle. At a convenient height are fixed a stopcock and a bye-pass. The latter is worked by a horizontal bar from either side, which permits of the instantaneous raising or lowering of the whole of the lights. The supply-pipe runs along the entire roof to the outlets opposite each lamp. The lamps employed are of two patterns—one containing a single burner, consuming 1 cubic foot of gas per hour, for use in second and third class compartments; the other provided with a duplex burner, passing 1½ cubic foot per hour, for first-class compartments. The light from the former averages about 7½ candles; and that from the latter, about 13 candles. The single burners are adjusted so that the full width of the flame is parallel with the carriage door. This position obviates the shadow thrown by the supply-pipe when the burner is at right angles. A new feature in the duplex lamp is the addition of a lug on the inside lamp ring, through which a vertical spindle actuates a bye-pass cock. A small rotation of this rod by a suitable button carrying an index pointing to the words "on" and "off," places the lowering of the light to a mere glimmer under the control of the passenger. [A sample of each of the lamps described was shown.] These patterns were decided upon, after repeated trials, as giving the best results; for it is hardly necessary to note that the conditions of burning when the carriages are standing are widely different from those produced by rapid travelling in a strong head-wind.

The compressing-engines have been supplied by Messrs. Pope and Sons; the storeage reservoirs and carriage fittings, by the Pintsch Patent Lighting Company; while the remainder of the gas-works plant has been designed and manufactured at the Inchicore works.

From a lighting point of view, a considerable improvement might be made in the choice of upholstering material for the first-class compartments; the dark-blue cloth commonly used being somewhat suggestive of the walls of a photometer room. If a lighter material were employed, although, perhaps, not so suitable in other respects, it would greatly assist the passengers' reading, by its improved reflecting power. A similar remark is applicable to the dark woods used in many carriage roofs. Veneering with light woods, or painting in pure white or French grey, should be encouraged as much as possible.

In conclusion, it may be added that the carriage reservoirs are of sufficient capacity to last the return journey between Dublin and Queenstown. The branch lines will be supplied from pairs of the large storeage reservoirs, mounted on trucks, which will be run on the main line to the respective junction stations.

The PRESIDENT thought the members would all agree with him that they were greatly indebted to Mr. Outon for his excellent description of the new railway lamp. The paper was an especially valuable one from the fact that Irish railways were very far behind in the important matter of lighting.

The SECRETARY (Mr. J. Whimster, of Armagh) said that the subject of the paper was one with regard to which his knowledge was not very extensive. He had read much about it, and had heard papers read; but further than this, he knew very little. There was, however, one matter which struck him forcibly. He thought Mr. Outon said that the retorts made 1100 cubic feet of gas per hour, which meant that each retort produced something like 200 cubic feet per hour or 4800 feet in the twenty-four hours. He (Mr. Whimster) would have thought that, under the circumstances, they would have had a greater produce per mouthpiece than this seemed to indicate. With reference to the size of the oil-retorts employed, did he understand Mr. Outon to say that they were 8 inches by 8 inches? and was the object of using such small-sized retorts to bring the heat into closer contact with the oil than would be the case in larger retorts? It was desirable also that they should know if they had any difficulty with the ascension-pipes—did they never get choked with carbon? And, further, he should like to know with what material the furnaces were fired; and if it took a great deal of coke to keep up the heats?

Mr. W. A. VALON (Ramsgate) congratulated Mr. Outon upon his paper; and he expressed his personal obligation to him, as he confessed the author had succeeded in making clear to him several points which had hitherto been obscure in his mind. He, however, had been struck by the same matter as that which had been introduced by Mr. Whimster—that with regard to the production of gas. He also wished to inquire how many cubic feet of gas were made from a ton of oil the specific gravity of which was given at ·840?

Mr. OUTON remarked that the works had been completed only during the latter part of the previous month; and so he had not had a chance of getting many results. The production of gas per gallon of oil used was, he believed, 72·75.

Mr. VALON proceeded to state that most railways were un-

doubtedly lighted in an indifferent manner. In America, however it would be quite impossible for the carriages to be lighted after the fashion adopted this side; and it was a great comfort to know that the question was engaging the attention of railway engineers here. He hoped they would succeed in making their railway compartments more endurable for passengers, as far as lighting was concerned, than they had hitherto been.

Mr. Outon, replying to the various criticisms, said that the largest retorts for oil-gas making—throughout England at all events—were 10 inches. There was an intermediate size; and another as small as 6 inches. The ascension-pipe (alluded to by Mr. Whimster) never became clogged in the least; its function being to gradually raise the oil to its boiling point, before it returned along the three upper retorts. The heat was much lower than that employed in the production of coal gas. The make of gas was 72·75 cubic feet per gallon of oil used. At present they only worked during the day—not day and night. When the winter season came on, however, and their carriages were all fitted up, it would perhaps be necessary to work day and night. Owing to the very small amount of gas made, he could not give definite information with regard to cost. But he estimated that, when the plant was in full working order over the whole line, the cost of the gas would be about 12s. per 1000 cubic feet—he did not think it would be less. As to residuals, they had no immediate market for the chief ones; but he understood that in England these were readily bought up by chemical manufacturers, who generally paid for their purchase about 1s. per gallon. It had often occurred to him that, where oil-gas works and coal-gas works were combined, all the residuals produced might be usefully employed.

Mr. A. Main (Glasgow) next read the following paper:—

THE HISTORY AND DEVELOPMENT OF COOKING BY GAS.

Forty-three years ago, in 1850, there was a somewhat remarkable scene witnessed in the ancient city of Exeter—an incident having for its central figure a very remarkable man, and notable in itself as being somewhat prophetic of a new order of things in one great department of human economy. In the centre of a large crowd, the object of a good deal of jeering ridicule, stood a French *chef*. The Royal Agricultural Society was holding its annual meeting in Exeter; and this French *chef* had been engaged to superintend the cooking of the banquet.

He tells us that he determined to signalize the occasion by serving a new dish—viz., "A Baron and Saddleback of Beef *à la* Magna Charta," weighing 535 lbs., or close upon 5 cwt. To roast such a joint at one time was a difficult thing to do, on account of the immense fire required; and former attempts, it seems, had not always been successful. A crowd gathered, in expectation of seeing a large bonfire lighted; but, to everyone's surprise, all that was visible was an oven 6 ft. 6 in. by 3 ft. 3 in., constructed roughly with a few bricks and a few sheets of iron. Into this temporary oven were introduced 216 very small jets of gas, through pipes ½ inch diameter. The on-lookers were incredulous; saying it was impossible so enormous a joint could be roasted by such means. But, after eight hours' roasting, it was found to be thoroughly cooked, at a cost (in those days of dear gas) of less than 5s.; and it was carried on the shoulders of eight men through the streets of Exeter, preceded by a band playing "The Roast Beef of Old England," and followed by a crowd of some thousands. The hero of this animated scene was none other than the illustrious Alexis Soyer, probably the greatest master of the culinary art ever sent to our shores by France—that country of *la grande cuisine*. Soyer was *chef* to the Reform Club in London, and superintended all the great banquets of his day. He wrote some of the most interesting and fascinating works on cookery which we possess; notably his "Pantropheon"—a book of immense research on the subjects of food and cookery. Soyer tells us, speaking nearly half a century ago, that "he knew well the power and efficacy of gas for cooking."

Such is the first authentic record I can find of the use of gas for cooking purposes. In the following year (1851), at the Great Exhibition in London, a patent gas cooking-oven was exhibited by Alexander Graham, of Glasgow. This oven was fitted with luminous jets inside—the gas issuing from three small needle holes in each burner; while an iron boiling-ring on the top was provided with similar jets, bored with four holes instead of three. As yet the Bunsen burner had not been used. Mr. Graham was a well-known and highly-respected hotel proprietor and *restaurateur* in Glasgow; and a number of his *confrères* in his city and neighbourhood were induced to follow his example in the use of gas for roasting. Mr. Graham made and sold a limited number of cookers for hotels and restaurants; but as yet the use of gas-ovens for domestic purposes was practically unknown. Mr. Graham was certainly one of the pioneers of gas cookery. About this period we find gas cookers made by Mr. Davis, of Bath; and various makers appeared in London, Birmingham, Leicester, &c.

Very strong prejudices had to be encountered and overcome before gas obtained anything like a popular hold on the ordinary consumer, and thoroughly established itself as an indispensable auxiliary in every first-class kitchen. The average cook, who, with perfect equanimity, exposed a chop or steak to the fumes of a coke or a coal fire, shuddered at the thought of a joint being exposed to the same fuel in a purified state, as received from the gas-works. Only those conversant with the trade in its early stages can recall the extraordinary and unreasonable prejudices which gas had to overcome—prejudices founded, of course, on ignorance, but nevertheless powerful and obstinate.

Now-a-days, when the use of gas as fuel is so universal, we are apt to forget that the trade has only assumed definite and popular form within the last dozen years. It was extremely difficult to sell gas cookers to ordinary consumers; and the trade would never have assumed its present great dimensions but for the fact that gas companies and corporations, alarmed by the first electric light scare, took the matter in hand, and turned their attention seriously to the subject of the value of coal gas as a fuel, and began to hire out the cookers at small rentals. Foremost among these, if not the first, was Mr. Alfred Colson, of Leicester, who entered into the matter with great spirit, and published a very valuable little pamphlet, entitled "The Economy and other Advantages of Cooking by Gas." This pamphlet was circulated in large numbers, and was a powerful means of educating popular opinion on the subject. Mr. Colson began by acknowledging that "the want of knowledge and appreciation of gas as a fuel on the part of the public had been largely due to the apathy displayed by gas companies generally in bringing before the notice of their consumers the merits of a commodity, of which they were the producers." At the same time, the leading medical journal, the *Lancet*, began to advocate the use of gas for cooking and heating; and this materially helped the extended use of gas for these purposes.

In 1882 a very valuable contribution was made to the subject by Dr. Stevenson Macadam, of Edinburgh, in a lecture delivered to the North British Association of Gas Managers (and published afterwards in pamphlet form), on "The Sanitary Aspects of Cooking and Heating by Coal Gas." By careful and prolonged experiment with the cookers of three leading makers, Dr. Macadam arrived at some very important and definite conclusions. One of these was that the cooking of meat in the gas-oven yielded a larger return of cooked meat than in the coal-oven. It was found (and this has since been amply demonstrated by other experiments) that, while a joint cooked in the coal-oven lost 40 per cent. of its weight in the process of cooking, the same joint would lose only 25 per cent. of its weight in the gas-oven. "To a large extent," says Dr. Macadam, "the difference of 15 per cent. is due to the meat being constantly surrounded by an aqueous vapour derived from the combustion of the gas. The influence of this moist atmosphere not only kept the meat more moist, but hindered the escape and evaporation of the juices; retaining the osmazome or flavouring matter, so that the meat when properly done is more juicy and more palatable, and yet free from those alkaloidal bodies produced during the confined cooking of meat in the coal-oven, which are more or less hurtful and even poisonous." Dr. Macadam further pointed out that the meat, being more juicy, is also more easily digested. This testimony, on the part of so high an authority, had a most favourable and beneficial effect in dispelling the remaining prejudices against gas cookery, and very soon rapid strides were made in the direction of improved construction of gas-stoves, and in the number of corporations and companies who hired them to their consumers.

Within the last ten years, the development of gas cookery has been very extraordinary. Exhibitions of gas appliances have been held all over the country, combined with free cookery lectures; and public opinion has been largely educated by this means. One aspect of the question is worthy of notice. We must all be conscious of the immense strides that have been made during the present generation in familiarizing the art of cookery in our country. After years of astonishing neglect, our Education Department at last awoke to the fact that cookery ought to form part of every woman's education; and during recent years County Councils have also expended large sums on this most important department of education. Schools of cookery have arisen in all the leading centres; and our Board Schools are now equipped with the necessary apparatus for teaching this important branch of domestic economy. It can scarcely have escaped the notice of observant spectators that this vital, but quiet, social revolution could not have attained its present dimensions but for the fortuitous circumstance of a new and much improved method of cooking—the introduction of the gas-oven.

Bound up with this question is the pressing and important matter of the solution of the smoke problem and the purification of the air of our large towns. Our rural population keeps crowding into the city; and as, year by year, the great towns increase in size, the smoke question has become one of the most pressing problems of the day. The question must sooner or later be faced and solved. Various solutions have been offered, but none so satisfactory as that which suggests the use of gaseous fuel, both for cooking and heating. Dealing with this subject a few years ago, the late Sir William Siemens said: "I hold that it is almost barbarous to use raw coal for any purpose, and that the time will come when all our fuel will be separated into its two constituents before reaching our factories or our domestic hearths. Such a measure would not only furnish us with the complete solution of the smoke question, but would be of great value as a money-saving expedient."

The following figures will be of practical value to managers of works where the system of hiring is in contemplation. They

have been kindly supplied to me by Mr. W. R. Chester, of Nottingham:—

Some Statistics as to the Purchase, Hire, and Cost of Maintenance of Gas Cooking-Stoves in Nottingham.

The average net cost of 1511 stoves purchased up to the end of the year 1891 was £4 0s. 3d. each.

The basis upon which the rental is fixed is as follows: 10 per cent. is deducted from the list price; and the rental is 10 per cent. on the balance. For example, a stove costs £5, or 100s.; 10 per cent. off = 90s.; 10 per cent. on 90s. = 9s. per annum, or 2s. 3d. per quarter. This is about 13½ per cent. on the net cost.

The average period for which a stove remains fixed is five years. The average cost of fixing, which is all done free of cost to the consumer, providing he rents a stove for a whole year, and not more than 30 feet of pipe are required for fixing, is 6s. 6d. per stove. The average cost of removing, cleaning, and repairing a stove is 6s. 6d.

The actual rent received for 1511 stoves on hire is £684, or 9s. each per annum. The average charge on each stove in use is as follows:—

Cost of fixing, one-fifth of 6s. 4d.	1s. 3·0d.
Removing, cleaning, and repairing	1 10·7
Refixing repaired stoves	0 4·4
Inspection and attendance on complaints	1 5·3
Proportion of show-room expenses	1 4·6
Total annual charge per stove in use	6s. 4·0d.

The excess of rental over expenses is thus 2s. 8d. per annum.

In ten years only five stoves have had to be renewed. The net rental at present received—2s. 8d. per stove per annum—will, at 5 per cent. compound interest, provide a renewal fund to replace all the stoves once in 18¼ years. The life of a stove, based on 10 years' experience, will not be less than 18 or 20 years; and therefore the present rental charged will be sufficient to provide against any actual loss on the business, and the profit on the gas consumed is therefore all clear gain.

The average increase in the consumption of gas where 385 stoves have been fixed is 15,438 cubic feet per stove for the first clear year. The gas used for cooking purposes gives an increase to the former consumption of about 4 per cent.

The President said he was sure they were much obliged to Mr. Main for his most interesting and instructive paper. The development of gas cookery was a question in which they were all very much interested; and the more attention that was given to it, the better. There could be no doubt that the sale of gas in the daytime, especially during the summer months, was very valuable. They knew that all their works preferred to have gas made in the daytime. The extra cost required to produce the gas necessary for cookery was, therefore, simply the cost of the coal, less the residual products; and a very considerable margin was thus left. He had often thought that the advantages attending gas cookery were not known, as they ought to be, by gas managers themselves; and this accounted for their apparent apathy in the matter. They ought, as gas managers, to make themselves cognizant of all these advantages; and the only way they could do this was by introducing the stoves into their own dwelling-houses. Then, when they had the information themselves, it was their bounden duty to make it known to the public. Mr. Main had referred to the prejudices existing against gas cooking. In his (the President's) opinion, these prejudices still existed to a very alarming extent. It was a great pity that it should be so; but this very existence should make them the more ready to endeavour to inform the public mind on the subject. Mr. Main was evidently unaware of the fact that it was not considered necessary in Ireland that cookery should be an essential branch of the education of girls; but he (the President) hoped the time would soon come when this condition of things would be changed. There was another difficulty connected with the introduction of gas-stoves into houses—that was the servant-girl difficulty, which most of them had experienced. However, they had partially surmounted this obstacle by fitting on lock-taps; and if any of the members intended going in for the hiring-out of gas-stoves, he would strongly urge them to adopt this course.

Mr. E. Stears (Lisburn) remarked that, as far as his experience went, gas cooking-stoves had given the greatest possible satisfaction. He had been informed that in Manchester no charge was made for the stoves; but he did not consider that they were as far advanced in Ireland as there.

Mr. J. T. Clark (Edinburgh) inquired if the tap the President referred to was in charge of the domestic or her mistress?

The President replied that it was intended to be in charge of the latter.

Mr. Ransome (Warrington), alluding to the observations of Mr. Stears, said that, from his own personal experience, the stoves were not let out even in Manchester free of cost.

The Secretary said that his experience with regard to gas-heating stoves was not a very encouraging one. He had them introduced into his own house, though he did not believe in them altogether, for they were too expensive for common use. When people had consulted him with regard to them, he had made a rule of advising them that, if they were prepared to pay for a luxury, they ought to purchase the stove outright. The gas-heating stove was very useful in an office or room, where its use conduced to the cleanliness of the books and papers contained in it. He thought, however, that everyone who could should pay to have a gas-cooker. The domestic servant difficulty was certainly a difficulty which was much experienced in the city he came from; for he thought that, in this respect, Armagh was perhaps more peculiarly situated than some other towns. Many of the ladies there did very little in the kitchen themselves; and the expense which was thus entailed by the negligent use of gas-stoves by servants was really monstrous. In a great many cases, the cost had turned out to be so great that the ladies had refused absolutely to have anything further to do with the stoves. For himself, he had connected with his gas-stove a meter by which he was able to accurately measure the amount of gas consumed. He strongly advocated the use of gas bath-heaters which were simple and effective; and he thought that householders should be encouraged to use them.

Mr. W. Ivison Macadam (Edinburgh) said he had no experience as a gas manager, but as a gas consumer he had experience of a cooker which he had introduced into his own house. The stove did its work thoroughly well; but——the "but" was the servant girl (laughter). He thought that if Mr. Main would adopt on his cookers some automatic principle, which would limit the expenditure of gas to the period during which the stove was actually being used—and this should certainly not be difficult—a great step would have been made in advance. As to the use of bath-heaters, he was of opinion that it would not be advisable to introduce many of them; as people now wanted something more than hot-water plunge-baths. Then, with regard to gas-fires, there was no doubt that they were good for offices. In his own library, he had found a gas-heater to be a great convenience, and a saving as far as the binding of books was concerned; while it had proved a decided source of comfort to him in his bedroom.

Mr. Clarke said he had in use an automatic invention of his own by which the consumption of gas in his cooking-stove was regulated.

The President said there was not a single one present but would admit that gas appliances were very efficient; but what they were more anxious about was the development of their gas business. Five years ago, there was not a gas-stove in Coleraine; at the present time there were something like 300 or 400. This result was achieved by simply keeping "pegging away;" and, as a consequence, they had already increased their business by 10 per cent., which was mainly accounted for by the introduction of gas-stoves. They were thus enabled to sell gas in Coleraine cheaper than they had ever done before; and they hoped to have another reduction shortly.

Mr. Main, replying to the various speakers, said, with regard to the lock-tap, that it was a very admirable thing, and as a firm they had advocated the use of such an appliance for years, so as to prevent as far as possible the waste of gas. It was very easily fitted; and it was very effective when properly locked. With reference to Mr. Macadam's remarks about an automatic gas supply controller, such a device was in existence; and a very good thing it was. But the trouble of all automatic arrangements was that they were so easily put of order. They were then worse than useless; in fact, their last stage was worse than the first. If a thorough automatic arrangement could be devised, there was no doubt that it would be a very good thing. Anent hot-water baths, if they wished a spray bath, it could only be accomplished by having a high-pressure boiler; but he thought it ought to be clearly understood, as one of the most important facts in connection with the development of the gas-stove business, that there was not the slightest difficulty in supplying a very simple and inexpensive arrangement to give water under pressure. A small boiler standing beside a cooker or in any other convenient place, could have a flow and return pipe connected with an ordinary high-pressure tank. This was all that was necessary. With regard to the use of gas-fires, he had always advocated putting them in bed-rooms and drawing-rooms—where proper economy could be exercised; but he had generally advised people against them for other rooms.

TAR FOR ROAD-MAKING PURPOSES.

At the recent Meeting of the Incorporated Association of Municipal and County Engineers at Harrogate, a paper was read by the Borough Surveyor (Mr. S. Stead) on municipal work in the town. In the course thereof, he referred to the tar macadam roads which are one of the features of the famous Yorkshire watering-place; and as, from the numerous inquiries he had received, he judged that this kind of roadway was coming more into favour, he said he thought it would be interesting if he gave a short description of the manner in which the materials were prepared and used. He then supplied the following particulars: The stone employed is limestone, obtained from a quarry at Pateley Bridge; and the tar is purchased from the Harrogate Gas Company. The ashes for firing the rough or foundation material are from the ordinary domestic ash-pits in the borough, and are well screened before being used. The rough or foundation material is prepared in the following manner: The limestone, broken to a 2¼-inch gauge, is spread upon the ground in a heap, about 6 feet wide, 15 to 18 inches high, and any convenient length. A fire is then lit on the top with wood and ashes; and the stones are gradually turned over and mixed until all are

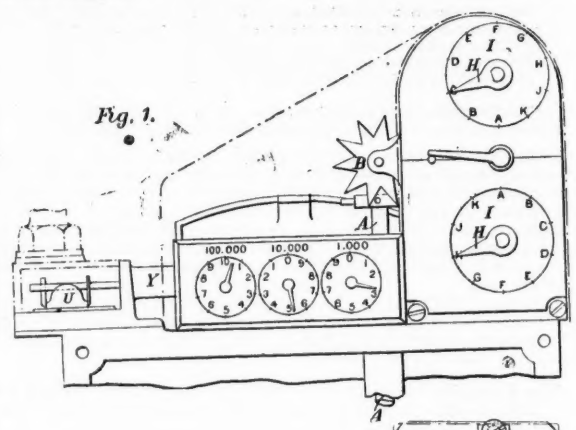
at the same temperature. The stone is afterwards spread on an iron plate while warm, and thoroughly mixed with tar, after which it is stacked in a heap ready for use. The materials are much improved by stacking for a few months before being put upon the roads. The surface material is prepared as follows: A bed of clean furnace ashes, 9 inches deep, 6 feet wide, and from 12 to 15 feet long, is formed on the ground, and covered with a similar depth of ⅜-inch screened stone. A fire is kindled on the stone, and entirely covered with ashes, which should be allowed to burn for at least three days, or more if the weather should happen to be unfavourable. The material is then thoroughly mixed while warm, and passed through a ⅜-inch screen. A pan is afterwards formed (as in slaking lime) with 6 inches of material on the ground, and the tar poured on and mixed until the whole becomes thoroughly incorporated. The material then remains in a heap for something like twelve hours, and is afterwards well mixed, and allowed to stand for two days or more, when it is stacked ready for use. In forming the roadway, a layer of the rough or foundation material, about 3 inches thick, is first put down and well rolled. This is followed by a sufficient quantity of ¾-inch chippings (prepared in a similar manner to the foundation material) to fill up the interstices and just cover the rough stone. It is again well rolled and covered with a thin coating of the surface material formed of ⅜-inch chippings and ashes, and rolled. The surface is finally sprinkled over with fine limestone chippings and rolled again. The edges next the channel are trimmed, and then beaten with an iron beater; and, after standing for a day or two, the road is ready for use. A 10-ton steam-roller is used for rolling these roads; and the total cost is about 2s. per square yard laid complete. The footpaths are laid in the following manner: Upon a prepared foundation of broken stone, a layer is put down 2 inches thick, formed of 1¼-inch limestone prepared in the same manner as for the foundation of the roadways, and well rolled with a hand-roller. This is covered with a ½-inch layer of the fine material, rolled, finished with a sprinkling of Derbyshire spar, and finally rolled; the edges being well beaten with an iron beater.

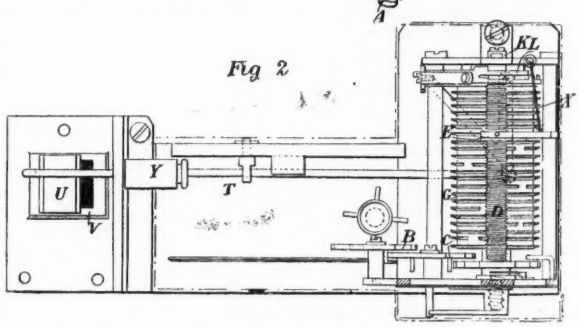
In the course of the discussion upon the paper, Mr. J. Hall congratulated Mr. Stead upon the improved appearance of his macadam as compared with the ordinary kind. He said some had tried it with success, while others had failed. He made some inquiries a few years ago; and he would indicate what he believed to be the real cause for the opinion that had been expressed against tar macadam. Some managers of gas-works were carbonizing on new systems, and employing temperatures widely different from the old ones, with the result that they produced tar which did not show any material difference, even to the analyst, although the grouping of the constituents was changed. He had tried tar under the two conditions—in the one case with success, and in the other failure. In some instances it would become hard and brittle after being down two or three months; whereas in others it would not set at all. It was advantageous to experiment to a small extent with any new tar, and also to watch the works from which it was obtained to see that there was no change in the mode of working. Mr. M. Hall said it would be interesting if Mr. Stead would give some information as to how long the roads and footpaths lasted without renewing both the tar and macadam, and state if much was saved with respect to street watering. Mr. Brown said, with reference to the tar paving, he did not quite agree with the mode of procedure adopted by Mr. Stead, nor with the process and method of preparation. He thought they should avoid burning outside. A principle which he considered to be better was to have a covered shed, and place all the materials in it. He found much better results from avoiding firing in direct contact with the material. If the ash were avoided, and also the fire test, they would have a better material. He did not agree with a previous speaker as to the change made in the temperature of carbonization in gas-works as affecting the quality of the tar produced. Too much of the mixing was left to a labourer, who knew nothing about the virtue of tar; and he thought that, if more care were given to this matter, they would have better tar macadam roads. Mr. Howcroft asked Mr. Stead if any of the main roads were made with tar macadam. If so, had there been any difficulty in obtaining a portion of the expense from the County Council. He also asked the author to quote the price per square yard. Mr. Stead, in reply, said they had four miles of main road; but no tar macadam had been used upon them. They had no difficulty with the County Council as to payment. With regard to Mr. M. Hall's question as to how long the tar macadam lasted, he said this depended a great deal upon the traffic; but he had not gathered any statistics during the four years and a half he had been at Harrogate. It had a very long life; and he should say it would last, on an average, about six or seven years. The footpaths also lasted very well indeed; but, of course, this depended greatly on the traffic. In reply to Mr. Brown as to the firing of the materials, the object undoubtedly was to get rid of the moisture; and, when the work was carried on in the open, of course the air interfered to a great extent. He quite agreed that it would be better to have it all under cover; but the only question was whether the initial outlay was sufficient to justify going to this expense. As to the ashes being mixed, this was a matter on which perhaps there might be a difference of opinion.

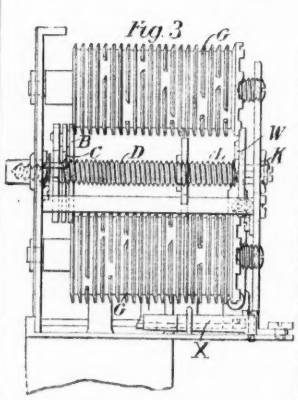
REGISTER OF PATENTS.

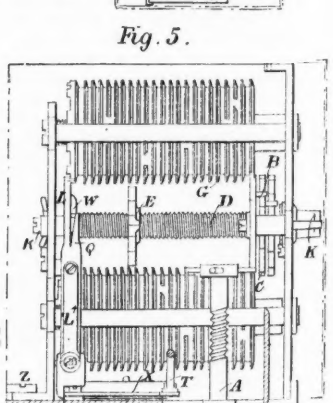
Arresting Gas-Meters when a Determined Quantity of Gas has Passed.—Green H., of Preston. No. 16,998; Sept. 23, 1892.

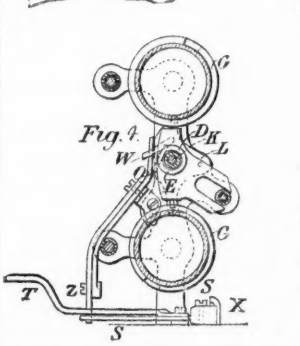
In the patentee's former invention (No. 8288 of 1891), there is described the combination of sets of stops on the meter, made adjustable in accordance with a pre-arranged table; a moveable part, adapted to travel in a path in which in certain positions of the stops it will be arrested; and means for imparting movement to the parts from the meter, while it is working. The arrangement is such that the arrestation of the moveable part by the stops will cause a stoppage of the meter, which will not again work until adjusted in accordance with the table applicable to the stop that caused the stoppage. In such apparatus according to the present invention, the meter is not suddenly arrested at the same time as the moveable part, but when the latter is stopped. The screw whereby it has been caused to travel, continues to be driven by the meter; and in this way suitable mechanism is made to shut off the supply of gas to the meter, which is thus stopped.

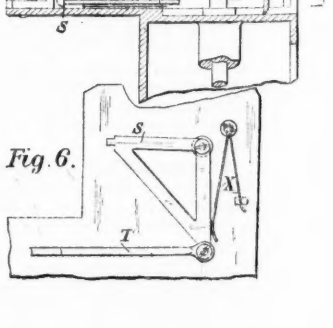












Figs. 1, 2, and 3 are respectively a front elevation, a plan, and an end view of the upper portion of a meter fitted to be arrested when a determined quantity of gas has passed through it. Figs. 4 and 5 are cross-sections of fig. 2, looking in the direction of the arrows. Fig. 6 is a detail view.

A is the spindle of a wet gas-meter, from which rotary motion is transmitted through a pin-wheel and star-wheels B and C, provided with driving-pins respectively to a star-wheel fast on a tubular screw D. E is a nut fitted on the screw D, and provided with a slotted extension embracing a fixed rod that prevents any rotation of the nut, and thus causes the nut to advance on the screw when the latter is rotated, and the former is free to move. G are sets of annular stops, arranged parallel to the axis of the screw D, and formed with breaks or gaps (one in each stop) to allow the projections of the nut E to pass. H are pointers—one on the pivot of each set of stops. I are indexes, by which the stops can be adjusted (in accordance with a key or table) to bring the gap opposite each projection, and thus permit the nut E to travel on the screw D, and thereby allow the supply by the meter of the desired quantity of gas. K is a non-rotating locking-rod carrying the tubular screw D, and also at one end a plate L with projections adapted (when the shaft is moved endways) to be thrown in and out of engagement, as the case may be, with lateral projections at the end of each set of stops G. The whole of these parts are arranged to operate substantially in the manner described in the former patent, except that the axis of the star-wheels is fixed, and the projections are fastened to the nut, instead of forming part of a carrier loosely pivoted to it as formerly described.

The tubular screw D is mounted to slide on the rod K; and, in proximity to its inner end, there is arranged according to the present invention, one end Q of a lever. The other end of the lever is arranged to actuate one arm S of a horizontal bell-crank lever, the other arm which is connected by a rod T to a slide-valve U, which controls a port V, through which the gas passes from the gas-supply pipe and valve-box to the interior of the meter. W is a pin fixed to the plate L, and arranged to act against a bent extension of one arm of the lever Q. X is a spring arranged to act against the bell-crank lever, and tending to move the valve into its open position and to keep the end of the arm Q of the lever in contact with the inner end of the screw D. Y is a stuffing-box carried by the gas-box, and through which the rod T works gas-tight.

The arrangement is such that, so long as the nut E is free to be advanced along the screw, the lever Q will act as a stop to prevent the endway movement of the screw, but that when the nut is arrested by its pins coming in contact with a pair of the annular stops G, the stop-lever (under control of the spring X) will permit the screw to travel endways, and in so doing move the lever to a sufficient extent to actuate the slide-valve U through the bell-crank lever S and rod T, and close the gas-port V. Thereupon the meter will stop; and the screw will cease to be driven until the parts have been re-adjusted.

The arm of the lever Q, instead of acting directly against the arm of the lever S, may advantageously be connected (as shown) by a pin and slot connection Z to a supplementary lever, the lower end of which acts against the lever-arm S. By this arrangement, the position of the slide-valve U relatively to the gas-port V can be adjusted to suit requirements. When the locking-rod K is moved endways, to cause the projections on the plate L to move and unlock the two sets of annular stops G, to allow of these stops being reset for a further supply of gas, the pin W, fixed to the plate L, will, by acting against the extention of the lever Q, move the arm away from the end of the screw D, and permit this screw, together with the nut E thereon, to be carried back by the locking-rod sufficiently to move the projections out of contact with the annular stops G that last arrested the nut. This movement of the screw D affords security against fraud, as the removal of the projections from the stops G, caused by the slight endways movement of the screw, has the effect of preventing the proper position of the stops being found by the sense of touch, and renders it essential to possess the proper key or table in accordance with which the stops must necessarily be adjusted before the projections will be able to pass through the gaps. The movement of the lever Q by the pin W also serves to close the slide-valve U, and hold it closed, so long as the projections are free from the lateral projections at the end of the stops G; but upon the fingers H being set to the proper key or table, and the projection being brought back into engagement with the projections, the extension will be released, and the spring X will act to again open the valve and permit a further quantity of gas to be supplied.

Manufacture of Gas.—Collett, H., of Finsbury Park, and Merichenski, M., of Tottenham. No. 17,067; Sept. 24, 1892.

This invention relates to the making of illuminating or explosive gas by passing air through an appartus in which it mingles with vapours furnished by a hydrocarbon contained therein. The proposal is to employ a special compound consisting of cocoa-nut oil and gasoline. The former may be in either of the forms known commercially as cocoa-nut oil or cocoa-nut fat; and it is dissolved in gasoline having a specific gravity not exceeding ·7. The proportions found best are 1½ lbs. of cocoa-nut oil to 1 gallon of gasoline.

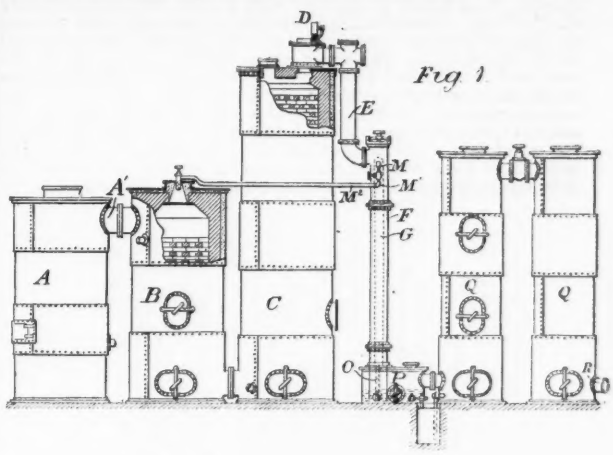
This compound may be used, say the patentees, for carburetting atmospheric air, and also for enriching coal gas, water gas, or any other gas the combustible or illuminating capacity of which it is desired to increase. It is, however, especially intended for use in gas-engines, and in the carburetter described in patent No. 6909 of 1892.

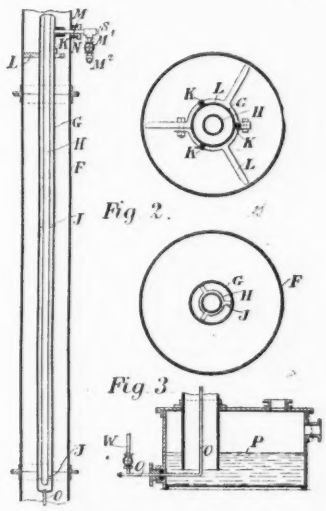
Manufacture of Water Gas.—Glasgow, A. G., of Westminster Chambers, London, S.W. No. 6324; March 24, 1893.

This invention relates particularly to the construction of the oil-heater used in the carburation of water gas.

Fig. 1 is a side elevation (partly in section) showing a gas manufacturing plant provided with this improvement; fig. 2 is a longitudinal and cross section, showing the construction of the oil-heater; fig. 3 is a central cross-section through the wash-box.

A is a water-gas generator of the usual construction; and B and C are superheaters or fixing-chambers. The gas passes from the generator to the superheater B; and oil is there sprayed into the gas through the oil-nozzle at the top. The water gas, carrying the oil with it, then travels through the previously heated checkerwork in the chamber B, through the conduit at the bottom, to the superheater C; and through the heated checkerwork in that chamber to the delivery-pipe at the top. This pipe is open at the top, and provided with a





valve or lid D, which is open to permit the products of combustion to escape while the apparatus is being heated up previous to the manufacture of the gas. When the apparatus is ready for manufacturing, the lid is closed; and the water gas then passes into the conduit E, and thence into and through the conduit F, into the wash-box P. From the wash-box the gas is passed to the purifier Q; thence to the purifier Q¹; and out to the main R.

The oil-heating device is situated in the conduit F. It consists of a tube G, supported in the conduit F by a spider L, upon which rest lugs K fixed to the pipe G near its top. This spider also insures that the pipe shall occupy a central position in the gas conduit. A socket is welded to the pipe G near its top, and so near the lugs K that the expansion and contraction, with the varying atmosphere, of the distance between them is inconsiderable. To this socket is secured the oil-delivery pipe M, which should be substantially at a right angle with the oil-heater, and which passes through the opening N in the gas conduit. It is continued as shown at M¹ M² leading to the oil-injector M³. With the bottom of the oil-heating tube G connects the oil feed-pipe O, leading from the oil supply. The bottom of the tube G, is contracted as shown. The feed-pipe O leads vertically to this contraction, as indicated in figs. 1 and 3, where the pipe O is shown as leading first vertically downward, then turning at right angles, and passing through an opening at the side of the box.

In order to ensure greater efficiency in the oil-heater, there is an internal rod H, running through the centre of tube G—substantially through its entire length, but terminating a short distance above the bottom. The top of the rod is welded to the top of the tube G, as in fig. 2, and lugs or spiders J, keep it concentric with the tube. The effect of this centrally located rod or tube is: Firstly, to cause the oil to pass upward through the heater in the form of a hollow cylinder; the oil being thus brought into close contact with the heated walls of the tube G. Secondly, to reduce the volume of oil left in the heater after the end of each run. Any accumulation within the heater, tending towards stoppage, can be removed by an occasional current of steam introduced at S, and discharged through the waste-tap W.

Manufacture of Carburetted Water Gas.—Merrifield, L. L., of Franklin, Mass., Westcott, J. T., of Cramers Hill, New Jersey, and Pearson, W. H., Jun., of Toronto. No. 8371; April 25, 1893.

This invention (for the manufacture of carburetted water gas) consists in combining a generator and one or more superheating or fixing chambers or sets of chambers, having four independent connections with the generator—two at top and one at bottom; each connection being fitted with a valve, to control the movements of the gases.

Fig. 1 [next page] is a vertical section; fig. 2, a horizontal section; and fig. 3, a vertical section of fig. 1.

The generator is provided with the usual grate to support the fuel; and there is an air-blast conduit in the lower part of the generator, a steam-inlet at the bottom, and a steam fuel-inlet in the top. X and W are two outlets at the top of the generator; Y and Z two outlets at the

bottom. Each outlet is provided with a valve, marked respectively P^1, P^2, P^3, P^4. The outlet X is a combustion flue—also used as a gas exit-flue; and its rear or exit end opens into a vertical flue in the wall of the superheaters. The upper end of this flue is closed; and the lower end is connected with the transverse flue that leads into the base of the superheating or fixing chambers. The outlet W is a gas exit-flue, connecting with a vertical flue W^1, which extends from the bottom to the top of the shell of the superheating or fixing chambers. The outlet Y is a gas exit-flue connected with a separate flue. The outlet Z is a gas exit-flue connected with the flue W^1. There are three superheating or fixing chambers, containing refractory material

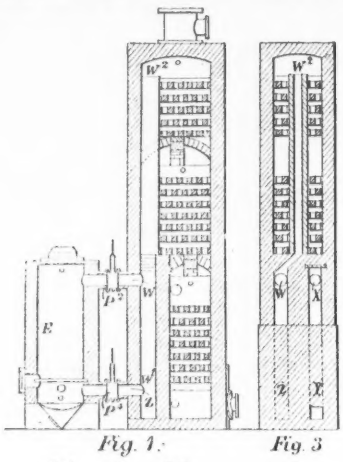


Fig. 1. Fig. 3

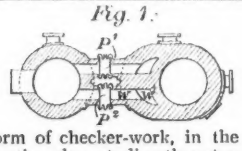


Fig. 2.

placed in the form of checker-work, in the usual manner. The products of combustion do not directly enter the superheating or fixing chambers from the flues leading from the generator, but first enter the vertical flues, and then the superheaters or fixing chambers. One of the objects in providing the vertical flues is to catch the dust and cinders before they enter the superheater or fixing chambers, and thereby avoid the deposition of dust and cinders upon the checker-work, and any subsequent clogging of the open work of the latter. The dust and cinders so arrested fall to the bottom of the flues, whence they are removed through suitable closed openings (not shown).

The superheating or fixing chambers are contained in one single shell, and are separated from one another by divisional arches, having openings therein for the passage of the products of combustion from one chamber to the other. Below and above the checker-work in the chamber F are located respectively the openings of the air-blast conduits. In each of the chambers are located the exit openings of oil-supplying pipes, with outlets for conveying the gas from the superheaters or fixing chambers to other parts of the works. They, or their pipe connections, are provided with valves (not shown); so that the gas, when occasion requires, can be diverted through one or the other of the outlets. One outlet is placed at the top and the other at the bottom of the superheaters, so that they can be used alternately.

The operation of the apparatus is as follows: On the fuel being introduced into the generator, the air-blast is turned on. The producer gas thus formed is allowed to pass to the superheaters or fixing chambers. Air is admitted into the chambers; and combustion is effected, so that the chambers are heated. The products of combustion are allowed to escape into the stack. When the fuel in the generator is sufficiently ignited, and the refractory material in the superheaters and fixing chambers is sufficiently heated, all the air-blasts are shut off; and steam is then turned into the bottom of the generator, and, passing through the ignited fuel, is converted into water gas. The valves P^2, P^3, and P^4 having previously been closed, the water gas passes from the generator into the bottom of the superheater or fixing chamber F, where it becomes highly superheated, by passing through the refractory material with which the chamber is filled. Hydrocarbon vapours or liquids are then introduced into the chamber F, where they are instantly vaporized and diffused with the highly superheated water gas. Both gases then pass on to the chambers, where the hydrocarbon vapours are gasified and fixed with the water gas; and the gases then travel to the washers, scrubbers, condensers, and purifiers.

When the heat in the generator ceases to decompose the steam, the hydrocarbons and steam are shut off; and the valve in the outlet-pipe is opened. The air-blast is then turned on; and the temperatures are raised as before described. When the heats are sufficiently increased to again decompose the steam, the air-blasts are shut; and steam is then introduced into the generator, and, passing down through the fuel, is converted into water gas. The water gas passes from the generator through the conduit Z into the conduit W^1, and passes out at the exit W^2 into a chamber, where it becomes highly heated by flowing through the heated refractory material with which it is filled.

Hydrocarbon vapours or liquids are then introduced, and become instantly vaporized and diffused with the highly superheated water gas. Then both gases pass on to where the hydrocarbon vapours are gasified and fixed with the water gas; and the gases then travel to the washers, scrubbers, condensers, and purifiers.

Chimneys of Regenerative Gas-Lamps.—Seddon, H. C., of Putney. No. 10,982; June 5, 1893.

This invention relates to improvements in lamps such as those described in patent No. 273 of 1889, where the flame burns inside a closed vessel of glass or other material—the air to support combustion being heated before it is supplied to the flame. The lighting of these lamps is generally effected either by removing the recuperator body, through the chimney, or by the introduction of a separate constant-burning flame under the burners. Either of these plans is more or less inconvenient; as when lighting from the top of the chimney or by the lighting device below the burners, an explosion of more or less violence is the result; and the removal of the whole of the upper portion of the lamp for lighting is not less inconvenient. The patentee therefore proposes to make the chimney in two parts (jointed together), in metal, china, glass, or other suitable material, or a combination of any of them; the division being made preferably at or near the crown of the dome-shaped part of the chimney, whereby the upper part can be removed for lighting either by means of a hinged joint, bayonet-catch joint, or straight-socket joint as shown. In a regenerative lamp of this description, with the chimney formed in two parts (one of which is glass or china, or some similar material) one portion of the chimney would be very likely to fracture by coming into immediate contact with the intensely-heated inner portion of the lamp; but this is obviated by using a washer of asbestos or other non-conducting material.

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14,717.—Germains, A. Z., "Flat-flame gas chimney-glass." Aug. 1.

14,783.—Cripps, F. S., "Washers for the extraction of tar, ammonia, carbonic acid, and sulphuretted hydrogen from coal gas." Aug. 2.

14,837.—Haller, J. G. P., "Burners for heating." Aug. 2.

14,846.—Gadd, W., "Ladder for gasholders." Aug. 3.

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14,891.—Boult, A. J., "Petroleum, gas, or oil engines." A communication from La Société Française des Moteurs Crébessac. Aug. 3.

14,918.—Brin's Oxygen Company, Ltd., and Murray, K. S., "Production of oxygen from atmospheric air." Aug. 3.

14,948.—Cuninghame, J., and Addie, J., "Treatment of blast-furnace, producer, and illuminating gas for obtaining cyanides therefrom." Aug. 4.

15,118.—Millar, A., "Gas and other engines." Aug. 8.

15,174.—Van Syckel, S. W., "Manufacture of gas." Aug. 8.

15,183.—Moss, J., and Beechey, C. G., "Apparatus operated through or by or freed by a coin or token inserted therein." Aug. 9.

15,193.—Goate, H. S., "Gas-purifier." Aug. 9.

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15,207.—Cunliffe, W., "Carburetting gas or air, &c." Aug. 9.

15,248.—Claremont, E. A., "Joints for gas, water, and other fittings." Aug. 10

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15,375.—Danner, B. and A., "Carbonic acid and other gas-engines." Aug. 12.

15,405.—Fryer, F. J., "Valve-gear for the Clerk gas-engine, and applicable to engines using a separate air and gas pump." Aug. 12.

Reduction in the Charge for Public Lighting at Richmond.—The Richmond Gas Company have intimated to the Town Council that, from Sept. 30 next, the charge for public lighting in the borough will be reduced from £3 15s. to £3 11s. 8d. per lamp.

New Joint Stock Companies.—The Burton Latimer Gas Company, Limited, has been formed with a capital of £3000, in £3 shares, to supply gas for lighting, heating, or motive power in Latimer, North Hampshire. The Cambrian Coke Company, Limited, has recently been registered with a capital of £25,000, in £100 shares, to carry on business as "purifiers of coal, manufacturers of, and dealers in, patent fuel, coke, and any products of coal, colliery proprietors, &c."

Gas Coal Contracts and Strikes.—On the minutes of the Gas Committee being introduced for confirmation at the last meeting of the Heywood Town Council, Mr. Chadwick, remarking upon the contracts entered into for the supply of coal, asked if the Committee had secured their contracts at a reduction of 12½ per cent. upon last year's contracts. The public ought to divide the reduction with the colliery proprietors, if the coalowners secured their demanded reduction in wages of 25 per cent. The Ex-Mayor (Alderman J. Cronshaw) said he did not know whether or not the Committee were getting a full supply of coal under their contracts; but, in regard to the question put by Mr. Chadwick, he thought that both corporations and manufacturers—all consumers of coal under contract—were improperly placed at a disadvantage under present arrangements. They made contracts with colliery proprietors for the delivery of coal in certain quantities and at certain prices. At the time those contracts were entered into, the proprietors knew the wages basis on which they made them; and there was some force in Mr. Chadwick's remarks about the strike and the 12½ per cent. reduction. He did not advocate that; but he thought the consumers ought to have some portion, if not the whole, of the reduction, if the colliery proprietors enforced it. But there was another point that required looking at. He could not see how it was fair, after contracts had been entered into, that one of the parties to those contracts should be the cause of a strike, which they professed to be anxious to avoid, and then be at liberty to avail themselves of a strike clause, and repudiate their liability to carry out their contracts. He should like to see a case tried in which colliery owners should be sued for any loss or damages by any manufacturers or corporations by the failure of a colliery owner to deliver coals at the price and in the quantities contracted for, when the colliery owner himself had caused a strike by his own acts after entering into a contract. Alderman Heywood observed that it was no use talking about sharing in a 25 per cent. reduction, as that had not been enforced yet, and was not likely to be. Alderman Firth, in reply to a question, stated that the Committee had about 1000 tons of coal in stock; and, if the strike did not continue longer than he expected, they would be all right so far as the supply was concerned.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our correspondents.*]

The Repair of a Wooden Jetty.

SIR,—Can any manager suggest some simple way of repairing a wood jetty? We have a wood jetty with 30 feet frontage, and four 12-inch baulks driven into the mud. There are many piles between these and the works, forming a jetty about 100 feet long with a railway on the top. Our front piles are nearly eaten off. Which is the best way to repair them? Some recommend me to drive new piles; others suggest screw piles. I shall be glad of any suggestion from those similarly situated who may have had more experience than myself in this matter.

Cowes, Aug. 18, 1893. A. THOMAS.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Aug. 11.

(*Before Mr. Justice* KEKEWICH.)

In the Matter of the Winding Up of the Staffordshire Gas and Coke Company, Limited.

This case involved a question of great importance in the winding up of companies—viz., whether an Official Liquidator who is unsuccessful in litigation in the winding up is entitled to have his costs paid out of the assets in priority to those of his opponents, where the assets are insufficient for payment of both sets of costs. The case was shortly as follows: The Company having gone into liquidation, the Chief Clerk settled certain persons upon the list of contributories. These persons then took out a summons to vary the Chief Clerk's certificate by striking out their names therefrom. The summons having been dismissed by the Chief Clerk with costs, it was, at the applicants' request, adjourned into Court. After hearing the arguments on behalf of the applicants and the Official Liquidator, Mr. Justice Kekewich, on Dec. 8, 1891, directed the names of the applicants to be struck off the list, and further ordered "that the Official Liquidator pay to the applicants, out of the assets of the Company respectively, the costs incurred by them in Chambers in consequence of the notice by the Official Liquidator to place them on the list of contributories, and of this application, and of the adjournment thereof into Court, such costs to be taxed by the Taxing Master; and the Official Liquidator is to be allowed his costs of the application and occasioned by the adjournment thereof into Court, and what he shall so pay to the applicants as aforesaid out of the assets of the said Company, such costs to be taxed by the Taxing Master." The Official Liquidator appealed, by leave, from this decision; but the appeal was dismissed with costs to be paid by him to the applicants. The Liquidator's costs of the appeal and of the hearing below were retained by him out of the assets of the Company. He admitted that he had remaining in his hands a balance of £220 14s. 1d. representing assets. But this sum was wholly insufficient to pay both the applicants' taxed costs, amounting to £142 19s., under the order of Dec. 8, 1891, and his taxed costs of the liquidation; and he claimed to have these costs paid in priority to those of the applicants. This was a summons taken out by the latter, asking that the Liquidator might be ordered to pay to them, out of the £220 14s. 1d. assets admitted by him to be in his hands, their taxed costs under the above-mentioned order. The arguments were heard by his Lordship on the 1st inst.; and, at their conclusion, he reserved judgment.

Mr. WARMINGTON, Q.C., and Mr. SWINFEN EADY, Q.C., appeared for the applicants; Mr. RENSHAW, Q.C., and Mr. C. G. HYDE for the Official Liquidator.

His LORDSHIP delivered judgment to-day. After citing and commenting upon the authorities bearing on the case, he said: The costs of the applicants now remaining to be paid under the order of Dec. 8, 1891, are admitted to amount to £142 19s.; and to this must be added the costs of this application, which, having regard to the history of the case, it would not be fair to throw on the Official Liquidator personally. He has in hand, I understand, £220 14s. 1d.; but he says that the costs of realization will absorb so much of this amount that but little will be left for the applicants. I am, however, told that, in calculating the money in hand, he has credited himself with his costs of resisting the applicants here and in the Court of Appeal, and also, strange to say, the costs which, by the order of the Court of Appeal, were directed to be paid by him, and not out of the assets. If these three items are all disallowed, as I certainly think they ought to be, the amount in hand would be so increased as to enable the Liquidator to pay the applicants in full after discharging all the costs of realization. It is for him to consider whether or not he will have an account taken; but it must be taken at his risk, by which I mean that he must look forward to being ordered to pay the costs of it, should the result be of no substantial benefit to him. My order, unless the Liquidator desires an account, will be that he do pay the £142 19s. and the costs of this application out of the moneys remaining in his hands as representing the assets of the Company, after deducting only the costs of realization. But, if he so desires, an account will be directed of the assets remaining after deducting only the costs of realization; and there will be liberty to apply in Chambers for payment of £142 19s. and the costs of this application after that account has been taken, and the costs of the account will be reserved. As it may involve consideration of figures, I do not insist on the Liquidator at once saying in what form he will take the order. The applicants are entitled to have it drawn up forthwith; and he must be prepared to elect before the Registrar.

Madrid Water Supply.—Owing to the increase in the population of Madrid, and the more liberal use of water, the two existing reservoirs have been found inadequate, and a third is to be constructed, for which the necessary authority has been obtained. It was at first thought that a covered reservoir would be preferable, the cost of which would be £220,000; but it has been decided to make an open one, and this will reduce the outlay to about £116,000.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at the Bridge House Hotel, London Bridge—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the notice calling the meeting; and the report of the Directors and the statement of accounts, which have already been given in the JOURNAL, were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said that as this was the first half-yearly meeting since the death of their lamented and highly-esteemed late Deputy-Chairman, Mr. John Mews (although they had had a meeting for the election of a Director to fill the vacancy), he could not allow the opportunity to pass without expressing the deep regret of the Directors at the loss of so able and highly respected a colleague. Mr. Mews had been for more than twenty years a Director of the Phœnix Gas Company and of their Company; and they all felt they had lost the father of the Board, and a man whom they all most highly respected. He had also to announce that their new Director, Mr. Benjamin Leigh Smith, was unfortunately absent owing to an accident which would keep him at home for a week. He had written expressing his great disappointment at his inability to attend; it being the first meeting after his election. Passing on to deal with the report, he referred to the capital account; and remarked that the Company were increasing their capital half year by half year in consequence of increasing business. They were obliged to extend their works to meet the probable demand, which had never failed them yet, and the failure of which they saw no reason whatever to anticipate. Of the amount expended of more than £50,000, £27,000 was for the extension of works, £12,000 for the extension of mains, £8900 for new and additional meters, and £9600 for stoves. The new meters and stoves were indicative of the large increase of business. He might remind the shareholders that this capital was all raised at a very low rate of interest. Under the auction clauses and their system of raising debenture stock, their capital was obtained at something like 4½ per cent.; so that, when people talked about "bloated dividends" of 13 per cent., they forgot that since 1876 all new capital had had to be issued and sold by auction, which had brought their dividend down from about 13 per cent. on the ordinary capital to something under 5½ per cent., which was the amount received by the proprietor on his investment in the Company. They had now a very respectable amount of premium capital—viz., £416,417—which was the result of the auction clauses. This capital was in their business without interest; and he thought that the public, when they talked about the Company's large dividend, might remember that, although they paid a large dividend on a portion of their capital, a large proportion received no dividend or interest at all. The accounts generally were about as usual; and he would not weary the proprietors on this occasion by referring to them in detail. There were, however, two items about which it was well that he should make a few remarks. With regard to coal, there was a difference in the Company's favour. In the half year it had cost 2s. 2½d. per ton less than in the corresponding period of last year; but in that half year there was an exceptional expense owing to the Durham strike, which cost the Company about £7000. Therefore, if they had not had this expense, the saving on coal in the past half year would have been about 5d. less than he had mentioned, or about 1s. 9d. per ton. Although, however, they had gained on coals, they had lost on products. With the decreased value of coal, coke had, of course, gone down, as had tar also. They had therefore lost something like £9400, which would reduce their gain on coal to 1s 6½d. per ton. As to tar, he might say that it seemed now that the production had again exceeded the demand; and it looked very much as if the only loophole of escape from very low prices would be that the gas companies generally should revert to the burning of tar for fuel, which they could very well do, and thus take off the market that which depreciated its value so seriously. The Company's new contracts for coal, he was happy to say, had been made at a further reduction; so it was probable that in the future the coal account would be something like 1s. a ton less than it was last year. While on this point, he might perhaps refer to some of the comments made in relation to the great strike now taking place throughout the Midland district. Happily, Durham having had its turn last year, he did not think it wanted a repetition. An argument very commonly used was that the price of coal had been brought down by cut-throat competition, and by great contracts with railway and gas companies, which paid high dividends, and which had not given the public the benefit of the low prices. So far as their Company was concerned, they had given the public the benefit of the low prices. But he would point out that, whatever might be the extra cost of coal, it did not come out of the pockets of gas shareholders; it really came out of the consumers' pockets. It was quite true that for a long time the Company avoided raising the price of gas; but nevertheless they did not take anything from their shareholders. The money required to make up the dividend they took from their reserves, which were thus depleted to a very large extent, and then they raised the price to the consumers. If coal went up again, it would be necessary for them at once to increase the price of gas. It was all very well, therefore, to talk about the miner getting the extra 40 per cent. on his wages; but who paid it? The general public, not the gas shareholder. The public, he repeated, had to bear the loss. He desired to say one word about the coalowners, who, it was almost hinted, gave away their coal. He, however, could say, from long experience, that the coalowners endeavoured to get the highest price they could for the article they had to sell; and they probably would always do so. They did not reduce the price of coal unless they were forced; and while he admitted that he had always found the coalowners of the North of England honest and honourable men, who would deal fairly, they were good men of business, and did the best they could for themselves in regard to what they had to sell. The other exceptional item in the

accounts was under the head of "law charges." A good many people did not like law expenses, and said that this was a most unsatisfactory item of expenditure. The Company, unfortunately, had paid £2800 under this head in the past half year. They endeavoured to live in peace and concord with their neighbours; and it was always their effort to try and avoid being any cause of annoyance. A year or two ago, however, there was a succession of fogs which lasted a week. During that time they had to make as much gas as possible, and the purifiers were changed rather more frequently than usual. The consequence was that, in taking out purifying material there was an increased emission of sulphuretted hydrogen, which had the effect of discolouring the paint on some small property near their works. This gave the opportunity to the owners of the property to try, in the first place, to stop the Company's business. They had erected plant for for the manufacture of sulphate of ammonia, whereby they hoped to increase their profit; and an application was made for an injunction to stop these works altogether. He was happy to say that the applicants entirely failed on this point. But they succeeded in convincing the Court that there had been an injury to the paint on their property; and they obtained a small amount for damages, although the sum was a great deal more than it should have been. Shareholders must not be alarmed if they again saw an item under "law charges," for it would not affect them to the slightest extent. There was a large proportion of honest people in the world; but there were also a considerable number who held different views about honesty. One of the plaintiffs in the action referred to said: "Where money is in question, everyone tries to get as much as he can;" and this was particularly the case when a company was concerned. They, however, were in the position of trustees for the consumers; and if they were willing to pay these people as much as they asked—those who tried to get as much as they could—they would find it a very expensive proceeding for the consumers. An extensive wharfinger who had a large strike among his workmen made the significant reply to him (Mr. Livesey) on his remarking that fighting was expensive: "It is cheaper than giving way." (Cheers.) He admitted that law certainly was expensive, and fighting was likewise expensive; but they considered that, if they were attacked in the manner he had indicated, it was decidedly cheaper for them to defend themselves than to give way to all sorts of claims. He might mention an example of the cases to which he had referred, which arose in connection with the litigation mentioned. One man said that his furniture was damaged; and amongst other claims was one of £9 10s. for the rusting of the wires of his piano. Now, everyone knew that sulphuretted hydrogen could not rust iron or steel, though it might damage paint. This, as he had said, was a sample of the cases to which he had referred, of people trying to get as much as they could. The Company, however, on their side, must endeavour to prevent this. The next point to which he would refer was the reduction of price. Some of their friends objected to their reducing the charge for gas; but in this manner they forestalled those newspapers who said that the public did not get the advantage from the gas companies of the reduced price of coal. They had invariably lowered the price when they could; and they would always do so. They brought down their price last March, and they had a balance on the right side at the end of the half year; and they contended that by reducing the charge they were serving the interests of the shareholders as well as those of the consumers. They were satisfied that the sale of gas at a low figure tended very materially to increase the business; and though the reduction made by them last March was only 1d. per 1000 cubic feet, it represented a benefit to the consumer of £28,000 a year, and gave them a pledge and a promise that, as soon as they were able to do so, they would make a further reduction. Most gas companies, in consequence of the extraordinary fine weather of the past half year, with almost continued sunshine for four months—had had a decrease in their consumption in the half year as compared with the corresponding period of the previous year. In the case of this Company, however, they were happy to be able to show, although not a large increase, that they had had an increase; and if they took into account that last year was Leap Year, with an extra day in the June half of 1892, and corrected the comparison to this extent, they would find that their increase was at a rate of 1½ per cent. in the six months, which he thought was very satisfactory. The next and most important point in the report—and it was really a novel feature—was mentioned in the fourth paragraph, relating to the extension of their business to the great bulk of the community. The railway companies had long ago found that the third-class passenger was the one who paid. The Company themselves had unfortunately found it hitherto impracticable—he had almost said impossible—to supply the working classes with gas. Oil was so cheap and so convenient, that they had been unable to go into that business; but, in consequence of the application of the "penny-in-the-slot" system to the gas-meter, they were now able to supply the working classes, who were anxious and eager to have the gas. He must say, in fact, that he had been rather surprised. They had been under the impression that the working classes cared nothing about it; but they now found that, given the facilities, they would take a supply of gas with the greatest readiness, The facilities they required were two: They wanted fittings put into their houses; and they did not want to be called upon to pay a large sum either in advance or when they had burnt the gas. But they were willing to take gas as they had taken oil—by pennyworths and such small quantities. The effect of the introduction of the "penny-in-the-slot" system had been to open the way to the Company supplying the great bulk of the inhabitants in their district. He had a paper which showed that the number of inhabited houses in the district was 172,600; but he thought this was rather under-estimated. The number of their consumers, however, was 81,900, or not quite half. He thought they might conclude that there were in their district 100,000 houses without gas; and it now looked as if they had found the means of enabling the occupants of these houses, or a very large proportion of them, to become gas consumers. The cooking-stoves, as the proprietors might have noticed, had continued to increase; and 25 per cent. of their consumers now hired a cooking-stove from the Company. There was still, however, room for a large improvement under this heading; and they were happy to say that the increase was fully maintained. In the twelve months to June, 1892, they advanced by 2755; whereas in the year to June, 1893, the increase was 2880. The next paragraph in the report to which allusion ought to be made was that relating to their employees. The profit-sharing system had now been in existence for four years. They were told, when they introduced it, that it would be all very well so long as they continued to give their workmen 5 per cent. on their wages as the result of the system; but that if they reduced the bonus, there would be an outcry, and that the thing would be a failure. When, however, they raised the price of gas, they had to reduce the bonus, on the principle on which it was fixed—the employees being on precisely the same footing as the shareholders. The latter received an increased dividend when the price of gas was reduced; and the workmen had an addition for every reduction in the price. They raised the price, and they therefore had to reduce the bonus to a little more than half what it was at starting; but the employees had accepted this quite cheerfully. He asked the men how they would like the reduction; and they replied that they would not like it at all, but that they would endeavour to get the price down again, so that their bonus might be increased. Some people might regard this bonus as a "fad" or as philanthropy; but he stood there prepared to assert that it was neither a "fad" nor philanthopy, but pure business. He would go so far as to say, as regarded the profit-sharing arrangement, that the amount credited to the men in the year to the 30th of June last—£8395—had not cost the Company a shilling, and that the whole of the sum had been provided out of the improved working of the men themselves. He might be asked how he would prove this. He made comparisons with other companies; and he found that, though they paid their men quite as good wages, or rather more than the other companies, yet that the cost of their labour was considerably less per ton of coal carbonized. Thus, he knew he was right when he said that the whole of the £8395 had been contributed by the improved working of the men. How had this come about? In the first place, the profit-sharing system had produced in the men a feeling that the Directors were anxious to deal justly and fairly with them; and this induced in the minds of the men a spirit of contentment and good-will. Men imbued with these feelings worked better, he was satisfied, than men who were discontented. About two years ago, a very capital article appeared in the *Daily Chronicle* on the labour question; and in that article there was this pregnant sentence: "Just now the object of labour is to do as little work as possible, and to get as much money for it as it can." His experience had shown him that there was a very great deal of truth in this; and it was simply to the fact that their men did not act on this principle that they attributed the result he had mentioned—that the money paid to them by way of bonus had been provided by their own improved work. The only other subject to which he wished to refer was that of the dividend, which was at the same rate as last year. They might, if they had chosen to force matters, have paid an additional ¼ per cent.; but he did not think it would have been fair to do so. The Act of Parliament specified that for every penny or part of a penny by which gas was supplied below a certain price, the dividend might be increased by ¼ per cent. They reduced the price by 1d. per 1000 cubic feet from March last; and, of course, this was part of a penny for the whole half year. If, therefore, they had chosen to cut things very fine, they could have divided another ¼ per cent.; but he thought it would have been unfair and unwise to do so. The Directors had therefore recommended that the dividend should be at the rate of 13 per cent. per annum; but he would remind the shareholders again that this was not an actual dividend of 13 per cent. as regarded a very large proportion of their capital, but one of only 5¼ per cent. As regarded the future of the Company, he looked forward to it with the greatest possible satisfaction. Everything was working harmoniously; the Directors, officers, and workmen were all pulling well together. While on the subject of the workmen, he might mention that the annual bonus which was declared was their own property, to withdraw, as they pleased, at a week's notice. On the 30th of June the amount was declared, and any man, and every man, if he liked, need only give one week's notice to withdraw the whole of the money placed to his credit. However, 44 per cent. of the men left it in the hands of the Company; and in regard to the remaining 56 per cent., some took the money out to put into building societies or to invest in the Company's stock. He thought this was very good evidence of the workmen's thriftiness, and also strong proof of confidence in their employers. He looked forward to the continued increase of the Company's business.

Mr. J. EWART seconded the motion.

Mr. HOUNSAM said he thought the introduction of gas into the houses of those in the "under walks" of life, by the "penny-in-the-slot" system, was calculated to prove of the highest educational advantage to the children brought up in such houses. It was, in fact, a species of technical education in the use of gas for lighting and cooking purposes. The children would not only learn to turn the gas on, but also to turn it off. Many of the children might become domestic servants, and in that capacity the knowledge they had acquired of the proper use of gas in their homes would be advantageous to them; and by using the gas in an economical manner—turning it off when it was not required—the use of gas was likely to become increasingly popular. This was what all who were interested in gas desired to see. They must all be greatly pleased wiih the success of the Company's working in the past half year.

Mr. DONKIN made an inquiry regarding the quality of the gas supplied; and other shareholders, whose names did not transpire, asked for further information regarding the use, &c., of gas under the "penny-in-the-slot" system.

The CHAIRMAN, in reply, stated, in answer to the shareholders last referred to, that the necessary mechanism was fitted to the gas-meter, and, on a penny being put in, a stop was removed which allowed the meter to travel until the pennyworth of gas was used. The quantity supplied for the penny was between 26 and 27 cubic feet (sufficient light for one burner for about six hours). As they reduced the price, they increased the quantity sold for a penny. There was one difficulty about it, which was that they could not get the meters.

Every week, therefore, they were getting more and more behind; and he was told that morning that upwards of 2000 orders were in hand which they could not execute because they could not get the meters. If any other gas company thought of adopting the system, he would urge them to be sure of being able to get a supply of meters, or they would be disappointed, and would disappoint their customers. In reply to Mr. Donkin's question, he said the quality of gas in London was fixed at a higher rate than could be obtained from the only available coal supply, which was from Durham. Such coal would produce gas of something near, though not quite, 16-candle power. The Company were, however, subjected to very constant testings; and they were consequently obliged to increase the quality to the extent of about one candle. This cost them not far from 1½d. to 2d., which was a great deal more than the extra quality was worth. Taking the cost of making gas, leaving out the question of dividend and distribution, it was about ¼d. per candle per 1000 cubic feet; but if they had to increase the quality beyond that which they could obtain from the available coal supply, it cost them three or four times as much. This was not to the interest of the public; the public would be better off with gas slightly lower in quality and cheaper in price, If gas was sent out rich, they received complaints that they were supplying "dirty" gas; and what was meant by "dirty" gas, was gas that smoked—rich gas. If they had sent out poorer gas, it would have been all right; but if gas was supplied of a higher quality than the burners were adapted to consume the carbon went away in waste—and it was waste both to consumers and the Company. They were hoping that common sense would prevail, and that in London there would be an agreement with the Authorities that the quality of the gas should be lowered to the point at which it could be most economically produced with the available coal supply—of course, with a corresponding reduction in price.

The motion was then carried unanimously.

The DEPUTY-CHAIRMAN (Captain T. B. Heathorn, R.A.) next proposed the declaration of the dividends recommended in the report. He remarked incidentally, in connection with the supply of gas by the "penny-in-the-slot" system, that there had been all sorts of ghost stories about it. When, however, the report of this meeting was read, he thought people would be induced to see this it was a very valuable matter. He was the oldest Director of the Company, and he could remember, many years ago, when they had the new gasholders, that there was a lot of talk about the failures they would prove to be, and so on. The management at that time, however, took the very best opinions they could get; and, believing in the new holders, they used them, and they had been successful. So with the "slot" system of supplying gas. They had taken the best opinions they could get; and, believing in the system, they felt convinced that it would prove a great success.

Mr. E. H. CARDWELL seconded the motion, and it was unanimously agreed to.

On the motion of Mr. HOUNSAM, seconded by Mr. MACE, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, in reply, thanked the proprietors for their renewed expression of confidence. He said the Directors' interests were bound up in the Company; and they were all endeavouring to do what they could to promote its prosperity—an object in which they had the co-operation of both officers and workmen, to whom, in conclusion, he proposed a vote of thanks.

The motion was unanimously adopted.

The CHIEF ENGINEER (Mr. Frank Livesey), acknowledging the vote, said he could confirm all that had been stated by the Chairman—that the officers and workmen co-operated together in the most pleasant way. Close attention was being paid to securing the fullest efficiency of the works. Their largest works were new, and their next largest works were equal to new; and when any proposal had been brought forward which would really reduce the cost of manufacture, it had been sanctioned and carried through. This course had been adopted at all the works; and he hoped they would be able in the future to reap the benefit by selling gas at a still cheaper rate.

The SECRETARY also acknowledged the vote; and the proceedings then terminated.

LIVERPOOL UNITED GASLIGHT COMPANY.

The Annual Meeting of this Company was held last Thursday—Mr. EDWARD LAWRENCE in the chair.

From the Directors' report, it appeared that the total revenue during the year was £584,716; and the expenditure, £491,446—leaving a surplus of £93,270, which had been transferred to the credit of profit and loss. After deducting the amount taken for payment of the dividend declared last February, and the interest on the bond and debenture debt, there remained a balance of £31,592. The Board recommended the declaration of the standard dividends for the past half year—viz., 5 per cent. on the ordinary consolidated "A" stock, and 3½ per cent. on the 7 per cent. "B" stock. To meet these, £18,791 will have to be taken from the reserve fund.

The CHAIRMAN said the report was not in one sense a very brilliant one; though, under all the circumstances, he felt there was no occasion for very grave disappointment. In the capital account, there had been a larger expenditure, owing to the works which were being carried out at Garston. These had entailed two-thirds of the expenditure, which had amounted to £48,800 during the twelve months. Some debenture stock had been taken up; and there was still a quarter of a million of ordinary and debenture stock to be issued. In regard to the revenue account, the difference between the expenditure this year and last was very trifling; being about £3000—£491,000 this year, compared with £488,000 in the previous one. As to the receipts, he pointed out that the money produced by the sale of gas showed an increase of £367 on last year. There had been an increase in the consumption of nearly 3 per cent. during the first six months of the year; but in the second half of the year, owing to bright weather, the consumption had been very greatly reduced. The loss on the residual products was serious. They received £6279 less for coke than in the preceding year, although 122,000 tons were actually sold, as against 107,000 tons. This arose from the bad state of the market; the average price being 5s. 6d. per ton, as compared with 7s. 4d. in the previous year. In respect to tar, the deficiency amounted to £6768; while the receipts for ammonia were within £600 of those of last year. The reduced income upon the residual products was £13,656, which, with additional items over and above the usual expenditure, made the amount of which they were short for their dividend £18,790. To meet the deficit, it was proposed that the reserve should be trenched upon to this extent; and he thought the proprietors would agree that this was the right course to take. Respecting the coming year, it was difficult to speak with anything like confidence, in consequence of the state of things at the present time. Their coal and cannel contracts had been made at a considerable reduction; so that the manufacture of gas would cost much less than it had this year. Concerning the coal strike, he said the Directors could not but look upon it otherwise than with anxiety, for the next few weeks at all events. They had done everything in their power to stock the greatest possible quantity of coals; but their storing powers were limited. However, they hoped that, before the time arrived when the stock would be exhausted, something would have occurred to ameliorate the condition of affairs. They would carefully watch the interests of the public and of the shareholders during the next few years; and he hoped that nothing would arise to interfere with the comforts of lighting which they now enjoyed. The public might assist them in this course by taking care that there was no unnecessary waste of gas. He concluded by moving the adoption of the report.

Sir THOMAS EARLE seconded the motion, which was unanimously adopted.

The retiring Directors and Auditor having been re-elected, a vote of thanks was passed to the Chairman and Directors; and the proceedings then terminated.

SHEFFIELD UNITED GAS COMPANY.

The Half-Yearly Report.

In the report to be presented to the shareholders of the above Company at their meeting on the 12th prox., the Directors state that the profits for the six months ending June 30 last were only £687 short of the sum necessary to pay the maximum dividend; being £36,567, as compared with £37,254 required. The two holders in course of erection at the Grimesthorpe station of the Company, which together will hold 3½ million cubic feet of gas, will be ready for use during the forthcoming winter. The Directors recapitulate as follows the principal points in the Provisional Order which they have recently obtained: (1) To authorize the issuing of debenture stock, bearing interest not exceeding 4 per cent. per annum, to the extent of £200,000; not more than £50,000 of such stock to be issued at one time, and six months to elapse between each issue. The stock as issued is to be put up to auction, and no single lot is to exceed £500 of the nominal value of the stock. (2) To authorize the Directors to declare forfeited, dividends on any shares or stock, other than the debenture stock, which shall remain unpaid for twelve years; the same to be treated as part of the profits for the year during which the same shall be forfeited. (3) To authorize the Company to construct works for the making and storing of gas and residual products on the land purchased from Lord Fitzwilliam, adjoining the existing works at Grimesthorpe. (4) To provide that the quality of the Company's gas, when tested by a Sugg's "London" Argand burner, No. 1, shall be equal to 16½ sperm candles of six to the pound, each burning 120 grains per hour. (5) To entitle parties depositing money with the Company as security for the supply of gas, or the purchase or hire of meters, to interest at the rate of 5 per cent. per annum on every 10s. so deposited for each six months it shall remain in the hands of the Company. The accounts accompanying the report show that the receipts in the past half year amounted to £132,791; the expenditure, to £97,456—leaving £35,335 to go to the profit and loss account. The quantity of coal and cannel carbonized was 89,657 tons; the residual products being 53,894 tons of coke and breeze, 5882 tons of tar, and 2,906,000 gallons of ammoniacal liquor. At the close of the ordinary meeting, there will be a special meeting to authorize the creation and issue of £25,000 of the debenture stock sanctioned by the new Order.

TOTTENHAM AND EDMONTON GAS COMPANY.

Directors' Report and Statement of Accounts.

The accounts of this Company for the half year ended June 30 last, to be submitted to the proprietors at their meeting next Saturday, show an increase of 1·92 per cent. in the quantity of gas sold over the corresponding period of 1892. This comparatively small increase is attributable in a great measure to the remarkably prolonged fine weather which has prevailed since March last. The number of gas-cooking stoves rented from the Company at Midsummer last was 562; this being an increase of 102. Comparing the prices realized for residuals with those obtained for the June half of last year, the cash returns for the sale of coke have been less, and there has been a considerable reduction in the price of tar; but sulphate of ammonia has slightly improved in value—the result altogether being that a sum of £556 less has been received for residuals. The Directors are able to report that they have secured the supply of coal required for the next two years upon favourable terms; and they trust no disturbing element will interfere with the contracts. In reference to the additional works mentioned in the last report, it is now stated that the brickwork tank for the reception of the new gasholder has been recently completed by the contractors (Messrs. John Aird and Sons). The holder is now in course of construction; the contractors having undertaken its completion by Oct. 31 next. The purchase of the land adjoining the present works has also been concluded; and the Company have taken possession of it. With respect to the £15,000 (second portion) of

"C" stock offered by tender in June last, this has all been allotted. It realized a net premium of £8950, equal to £59 17s. 4d. per cent. The profit and loss account (net revenue), inclusive of the undivided balance of £1876 brought from last half-year's accounts, shows an available balance of £6393, from which the Directors recommend the payment of dividends (less income-tax) at the rate of 11½ per cent. per annum on the "A" stock, and of 8½ per cent. on the "B" and "C" stocks. These will amount to £6251, and leave a balance of £141 to be carried forward. With regard to the statements given as to the manufacturing operations, it is shown that during the half year 13,287 tons of coal and 546 tons of cannel were carbonized, and 30,400 gallons of petroleum spirit were used as a substitute for cannel. The following are the quantities of residuals produced: Coke, 8689 tons; breeze, 1354 chaldrons; tar, 152,658 gallons; ammoniacal liquor, 3964 butts; and sulphate of ammonia, 175 tons.

BROMLEY GAS CONSUMERS' COMPANY.

Half-Yearly Report and Accounts.

The Directors of the above Company have issued their report on the results of the operations of the past six months. Dealing in the first place with the consumption of gas, they state that there has been a further increase, as compared with last year, of nearly 3 per cent., which, considering the brightness and warmth experienced during almost the whole of the half year, is very satisfactory; the increase for the month of January, when the conditions of the weather were normal, having been about 11 per cent. On a similar comparison, there has been a large reduction in the cost of coal and some other matters, and an increase in a few items; showing on balance a saving of upwards of £1470. On the other hand, the residuals have produced about £600 less than last year; coke and tar alone, owing to the exceptionally low price obtainable, showing a decrease of nearly £750. Sulphate of ammonia, however, has gained £200; and the market prices for that product have recently been more satisfactory. The profit and loss account shows a balance of £5545 (as against £5075 in 1892) to be dealt with at the meeting on Thursday; and the Directors recommend that dividends should be declared at the rate of 11½ per cent. per annum on the ordinary 10 per cent. shares, and 8½ per cent. per annum on the ordinary 7 per cent. shares—amounting together to £5234, and leaving £311 to be carried forward. The Directors further report that the works in connection with the enlargement of the retort-house and the erection of new retort-arches with regenerative furnaces, and also the new purifying-house and apparatus, are now sufficiently well advanced to warrant a confident expectation that they will be completed in ample time for the requirements of the ensuing winter. In June last, 200 shares were put up for sale by auction; being the first portion of the new capital authorized to be raised for these purposes. They realized the satisfactory price of £3227; or, on an average, £16 6s. 7d. per share. The remainder it is intended to raise partly by the issue of debentures bearing 4 per cent. interest, and partly by a further sale of shares in the autumn.

The accounts accompanying the report show that the receipts in the past half year amounted to £16,823; and the expenses, to £11,054—leaving a balance of £5768 to go to the profit and loss account. The working statements show that 8775 tons of coal were carbonized, and that the make of gas was 86,148,000 cubic feet; the residuals produced being 8775 chaldrons of coke, 1086 chaldrons of breeze, 80,735 gallons of tar, and 83 tons 2 cwt. 2 qrs. of sulphate of ammonia.

PROVINCIAL GAS AND WATER COMPANIES.

In the paragraphs given below, we record the genera results and other particulars concerning the working of the provincial gas and water companies named during the past half year or year as the case may be.

Gas Companies.

The extraordinary high temperature of the past half year, as compared with that of the corresponding period of 1892, has considerably reduced the consumption of gas in the case of the Bath Gas Company. The price obtained for coke has also been affected; and the market value of tar has fallen. On the other hand, however, there has been a decrease in the expenses of manufacture. Turning to the revenue account, it is seen that £25,482 was received from private consumers and for public lighting; £517 for meter-rental; £261 for stove-rental; £5031 for residuals; and minor items made the total income £31,476. The manufacture of gas absorbed £20,504; distribution, £2184; lighting and repairing public lamps, £574; rates and taxes, £1127; rents, £31; management, £1655; and two other small items made the total outlay £26,155. The balance carried to profit and loss account is, therefore, £5321; making the amount available for division £8318. The Directors recommend the maximum dividends.

During the past six months, the Bristol Gas Company have had a decrease of 4 per cent. in the quantity of gas sold, as compared with the corresponding period of 1892; but this is accounted for by the exceptionally warm and bright weather. The diminution is, however, more than counterbalanced by the saving effected on coal and manufacturing charges. The receipts for gas (including public lighting) amounted to £99,960, as against £104,142; the meter and stove rental came to £1914, being about £8 less than last year; residuals produced £24,031, which is a falling off of £760; and rents and transfer fees amounted to £211—making the total income £126,118, as compared with £131,130. The expenditure totalled to £93,917, which is £11,299 less than the June half of last year. With the exception of about £570, the reduction is brought about by a decrease in manufacturing expenses. The profit on revenue account (£32,201), after paying the maximum dividend on the ordinary stock and interest on the debenture stock, and carrying £5000 to the reserve fund, leaves a balance of £546, which, with £5568 brought from the previous six months, will allow £6114 to be carried to the credit of the current half-year's accounts. The Directors report that the large gasholder tank at Barton Hill is completed; and the holder is in course of erection. When finished, the Company's storeage capacity will be nearly doubled. The maximum dividend at the rate of 5 per cent. per annum on the nominal capital of the Company is recommended. With regard to the manufacturing operations, the quantity of coal carbonized during the half year was 75,477 tons; and of cannel, 9253 tons. The residuals made were as follows: Common coke, 49,602 tons; cannel coke, 5271 tons; breeze, 6358 tons; tar, 857,772 gallons; and ammoniacal liquor, 1,835,792 gallons.

The accounts submitted at the meeting of the Colchester Gas Company last Friday showed that the income during the past half year had amounted to £11,147, divided as follows: Gas, £8920; meter-rental, £78; coke, £1513; tar, £271; sulphate, £334; and sundries, £29. The expenditure amounted to £8999—the principal items being: Coal, £4787; wages, £880; rates and taxes, £722; repairs and maintenance, £1134. The revenue balance was £2148; and the profit and loss account showed an available sum for disposal of £10,523.

The half-yearly meeting of the Cork Gas Consumers' Company was held last Wednesday. In their report, the Directors said they had pleasure in noting a continued improvement in the rental received for gas—an increase which they were satisfied would have been greater were it not for the remarkably fine and bright weather of the spring and early summer. The increase in the private rental amounted to £467, and in that received from the public lamps to £73; the improvement being about 3 per cent. The cost of coals, they stated, had been considerably reduced. But, on the other hand, the receipts for residuals showed a large falling off—sulphate of ammonia touched the lowest point on record; tar was very cheap; and coke was reduced in price. In regard to the works, the report mentioned that the reconstruction of a bench of 64 retorts, to be heated by gaseous furnaces, had been commenced; and that some of the mains would have to be enlarged, and a new holder (to be charged to depreciation) would have to be provided in place of No. 3 holder, the cast-iron tank of which is in perfectly good order. Having remarked upon the misfortune of the Company in losing by death Mr. T. Bresnan (whose services on the Board were highly valued), the Directors announced that they had carried £300 to the depreciation account; and, after this allocation, the balance of profit and loss amounted to £5710. Out of this they recommended the payment of the usual dividend at the rate of 8 per cent., which would absorb £5677, and leave £23 to be added to reserve. At the same period in 1891, they had to take £813, and in 1892 £381 from reserve, in order to supplement the dividend. With the addition, the reserve will stand at £13,028.

The East Ardsley Gas Company have surmounted their recent financial difficulties in a manner which must be very gratifying to the shareholders. Owing to the defalcations of the late Secretary, no dividend could be paid last half year; and the reserve fund had to be heavily drawn upon to wipe off the deficiency at the bank. The working of the past half year, however, has resulted in a balance of profit (including £169 brought forward) of £409, which will admit of the payment of a dividend of 5 per cent. per annum, free of income-tax.

The revenue account of the Eastbourne Gas Company for the half year ending June 30 last shows a net profit of £5068, which, added to the £8095 brought forward, will give a sum of £13,163 available for dividend. The Directors, therefore, recommend that a dividend be declared at the rate of 13 per cent. per annum on the £20,000 original capital, and the £12,490 raised on the "C" shares, and at the rate of 10 per cent. per annum on the £55,000 paid-up on the "B" shares, and at the like rate, from the 1st of June last, upon the £10,000 additional capital raised on the "B" shares. These several dividends will absorb £4944, and leave a balance of £8219 to be carried forward.

The annual meeting of the Kendal Gas and Water Company was held last Tuesday. It was reported by the Directors that the profits of the past year amounted to £3502. An interim dividend at the rate of 6 per cent. had been paid; and this, with interest on bonds and bank interest and commission for the twelve months, absorbed £1219—leaving a balance of £2282 to be disposed of. The dividend on the preference shares would require £556; and the Directors recommended a dividend at the rate of 6 per cent. on the ordinary shares. The Directors proposed that of the balance of £849, £800 should be placed to the credit of the suspense account, and £49 to the reserve and renewal account. The production of gas during the year was 46,972,000 cubic feet, as compared with 45,821,600 cubic feet the preceding year, or an increase of 2·51 per cent. It was also mentioned that extensions and renewals of the works (including a new governor-house and improvements in the distributing plant) were being carried out, and that two new settings of retorts on the generator principle had been erected, and were now quite ready for working. With regard to the Water Department, the Directors said they had adopted the Deacon waste-water meter system, with a view of minimizing the waste of water and localizing leakage. In moving the adoption of the report, the Chairman (Mr. W. D. Crewdson) pointed out that the net profit on the gas section of the business was £2120, and on the water portion, £1381. In the general balance-sheet was the item "suspense accounts *re* Marcellus Thompson, £1579," which the Directors proposed to deal with by carrying to the credit of the account, £800; leaving a sum of nearly an equal amount still standing to the debit of that unpaid account. The defalcations of the late collector originally stood at £4232. Among other interesting matters touched upon, the Chairman stated that their Manager (Mr. T. N. Ritson) had adopted the penny-in-the-slot gas-meter; and 21 had already been fitted up.

At the annual meeting of the Kidsgrove Gas Company last Wednesday week, it was reported that the revenue was £188 less than in the preceding twelve months; this being mainly due to the reduced value of tar and ammonia. The expenditure had been heavy during the year, especially in renewals and repairs. With regard to the future, the Directors were pleased to announce that they had contracted for a supply of coal on rather better terms than in the preceding year, and were getting a slightly improved price for tar. There was also a fair prospect of the sales of gas being maintained during the coming year. A sum of £1228 was available for distribution; and the usual dividend of 10 per cent. was declared on the £9240 capital, and a dividend at the rate of 7 per cent. on the £4305 received in calls on new shares.

The shareholders of the Malvern Link Gas Company held their

half-yearly meeting on the 5th inst. The revenue account showed that a profit of £303 had been made during the past six months (the income having been £1218); and a dividend at the rate of 7 per cent. per annum was declared. On this occasion, the proceedings were made unusually interesting by the resignation of the Chairman (Mr. Holland), who was one of the founders of the Company, and had been at its head during the past 27 years.

The Chairman of the Newport Gas Company (Mr. E. J. Phillips) had a very gratifying statement to lay before the shareholders at their meeting yesterday week. The profits, he stated, were £1000 in advance of the corresponding period of last year; and there had been an increase in the make of gas of 3 per cent. A saving had been effected in the cost of coal and in labour; but rates had increased, and, in common with other companies, they had had a falling off in the amount realized for residual products. There had only been three transfers of stock during the year; and he believed that gas companies still stood as high as ever in public opinion, notwithstanding what had been said as to electric lighting. Personally, he did not think the introduction of the electric light would do harm to their undertaking. He noticed that the Corporation had decided to acquire an installation, for £20,000; but under the circumstances, he thought they should have allowed a private company to see if they could make it pay, and not utilize the ratepayers' money in a speculation. The Alexandra Dock Company and the Gas Company were the largest ratepayers in the town; and they would not gain any advantage from the expenditure. It was proposed to confine the operations for the present to a small district; but all ratepayers outside the area would have to contribute to the expense. There was, he was happy to say, a large amount of coal in stock, so that they had no need to fear the present disturbance in the coal trade. The report and accounts (which were noticed last week) were passed; and the maximum dividends of 10, 7½, and 7 per cent. on the "A" and "B" stocks and "C" shares were declared.

The half-yearly general meeting of the Weymouth Consumers' Gas Company was held on the 10th inst., under the presidency of Mr. R. Thomas. In moving the adoption of the report—some particulars from which were given in the JOURNAL for the 8th inst.—the Chairman congratulated the proprietors on the satisfactory condition of the Company's affairs therein shown. There had, he said, been a steady increase in the sale of gas; but the residual products did not realize the former prices, and therefore did not place the Company in so buoyant a condition as would otherwise be the case. However, it was a great source of congratulation that the Board were enabled to hold their own, and to offer the shareholders the statutory dividends. While this state of things was gratifying to the Directors, they were bound to tell the shareholders that it had not been arrived at without much anxiety. In the coal market, from which their staple product was obtained, the miners had struck; and this created uncertainty in the business, irrespective of any additional charge which might be incurred. He hoped the northern coal pits, from which the Company drew their largest supply, would not be interrupted. The Manager (Mr. James Lowe) had taken all precautions by having as large a stock of coal as possible, and securing, as far as the local agents were concerned, a continuous delivery. The report was adopted.

Water Companies.

The report to be submitted at the forthcoming meeting of the South Hants Water Company states that the progress of the concern has been maintained. The rental during the past half year has increased by £379; 299 additional houses have been supplied with water; and the net profit is £2586. The Directors propose to pay an interim dividend at the rate of 5 per cent. per annum on the old ordinary shares, and at the rate of 3½ per cent. on the new shares. They have converted the whole of the redeemable 5 per cent. preference shares of £10 each into shares of the like value bearing interest at 4 per cent. The laying of a new 12-inch main from Romsey to Eastleigh has been completed, whereby an abundant supply of water to that district has been provided. To meet the growing requirements of the Company, it is intended to increase the engine and boiler power at Timsbury, and to sink an additional pumping well there. In order to provide the capital for the carrying out of these and other works, and for the general purposes of the Company, the Directors purpose applying to Parliament next session for the necessary powers.

In the report of the Directors of the Woking Water Company, it is stated that the total expenditure on capital account to June 30 last has been £72,012. The revenue for the past half year has been £2572; and the working expenses, £916—leaving a balance of £1656 to be carried to the profit and loss account. The balance available for division is £1522; and the Directors recommend the payment of an interim dividend at the rate of 4 per cent. per annum for the half year, free of income-tax, which will absorb £1229.

The Purchase of the Runcorn Water-Works by the Improvement Commissioners.—The Runcorn Improvement Commissioners have agreed to accept a tender of the Manchester Trust, Limited, to lend £69,000 for a period of 30 years, at 3¼ per cent. per annum, for the purchase of the Runcorn, Weston, and Halton Water-Works, and for the payment of the expenses incidental thereto, at a commission of 1¼ per cent. on the amount of the loan, and subject to the payment of a sum not exceeding £100 in respect of law expenses.

A Columnless Holder for the Wanganni (New Zealand) Gas-Works.—A few months ago, a gasholder at the above-named works was overturned by the wind, owing to the defective working of the tank guides. At the time of the accident, the holder was inflated to within 16 inches of the water-level in the tank; and a sudden gale caused it to go over—lifting the side to windward out of the tank. The bottom curb caught on the top of the tank, causing the holder to unseal; and after a sudden rush of gas the vessel collapsed. To replace the holder (which had an external framing of cast-iron columns), the Company have given an order for the erection of a columnless one on the Gadd and Mason principle, in which the latest improvement—viz., fixing the spiral guides and carriages externally instead of internally, to facilitate inspection of the working parts—has been adopted. Messrs. Hick, Martin, and Drysdale, of London, Australia, and New Zealand, have entrusted the work to Messrs. R. and J. Dempster, of Manchester.

THE EXAMINATIONS IN GAS MANUFACTURE.

The Question Papers.

In the JOURNAL for the 25th ult., we were enabled, through the courtesy of the Superintendent of the Technological Examinations of the City and Guilds of London Institute (Sir Philip Magnus), to publish the names of the successful candidates in the last examinations in "Gas Manufacture" conducted by the Institute. We now give, from the recently-issued "Programme of the Technological Examinations" for 1893-4, the questions then put to the candidates:—

Ordinary Grade.

1. Give a description, with sketch, of any ordinary form of clay retort. At about what temperature should it be worked to give the best results. 2. What is the effect upon coal gas of the process called "condensation." 3. What is the function of the hydraulic main and dip-pipe? 4. Is it usual to work the retorts under pressure? Give reasons for your answer. 5. What materials are used for purifying gas, and how and why are they so used? 6. Describe the method by which pressure in the distributing mains is regulated. 7. What is an open-bar photometer? Describe its use. 8. How would you ascertain the quantity of sulphur in spent oxide? 9. Describe an Argand burner. 10. How are the joints of a gas-main usually made; and, in laying such main, what provision is necessary in the event of variations of level?

Honours Grade.

1. What kind of common coal is most valuable for gas manufacture, and why? 2. Describe the different methods of heating gas-retorts, and explain the principles upon which they severally proceed. 3. State approximately, in grains per 100 cubic feet, the quantity of each impurity present in the gas at the inlet of the purifiers, and describe a process for complete purification. 4. How does the specific gravity of gas affect its distribution? 5. Give the proportions, by volume, of the various constituents of a typical sample of gas, as ordinarily expressed; and explain the effect of the non-combustible constituents upon its illuminating power—quoting authorities for your answer. 6. Explain the principles upon which each of the following burners are constructed: Argand; regenerative; incandescent. 7. Give a description of any system of stoking machinery with which you are acquainted, and explain its advantages over hand labour. 8. What provision would you consider necessary as a substitute for the trussing of the crown of a gasholder? 9. Name some of the forms of apparatus used for the complete removal of ammonia. Describe any one of such forms, and explain its action. 10. Describe how you would estimate the quantity of CO_2 and H_2S in a sample of coal gas, by any method with which you are acquainted.

With the view of assisting students who may be preparing for examination next year, we extract from the programme the syllabus of subjects upon which the questions are likely to be founded:—

Ordinary Grade.

1. The construction of a retort or oven best adapted for the destructive distillation of coal. 2. The setting of retorts and the construction of retort-furnaces. 3. The effects of temperature in modifying the quantity and quality of the gas produced. 4. The description and arrangement of apparatus employed for the conveyance of the gas immediately upon its leaving the retorts. 5. The description of apparatus best adapted for condensing and cooling the gas. 6. The most suitable condition of the gas for effective purification. 7. A description of the various instruments used in gas-works for ascertaining and recording pressure and exhaust. 8. The laying of mains and service-pipes. 9. The construction of gas-meters. 10. The fixing of meters and the fitting up of premises for the supply of gas. 11. A description of the various kinds of gas-burners in general use. 12. The use of an exhauster. 13. The methods employed for controlling pressure at the works, so as to secure an adequate supply of gas at the various points of consumption, with a due regard for economical effect. 14. The simplest methods of ascertaining the purity and illuminating power of gas. 15. A description of the materials and methods employed for the purification of gas. 16. Influence of temperature and atmospheric pressure upon the volume of gas. 17. A description of the various tests employed for determining the values of ammoniacal liquor and spent oxide.

Honours Grade.

In the examination for honours, more difficult questions will be set in the above subjects; and, in addition, a knowledge will be required of: 1. The characteristic properties of the various kinds of coal, and their value for gas-making purposes. 2. The effects of temperature upon the production of residuals. 3. The chemical composition of coal gas. 4. The chemistry of purification. 5. Quantitative tests for impurities. 6. The development of illuminating power. 7. The practice of photometry. 8. Labour-saving appliances in the retort-house, and the working of retorts. 9. The construction of gasholders, purifiers, and other gas apparatus. 10. The working up of ammoniacal liquor. 11. The principles of combustion, and their application to the working of retort-houses.

A provisional certificate will be granted on the results of the above examination. For the full technological certificate in the Ordinary Grade, the candidate who is not otherwise qualified will also be required to have passed the Science and Art Department's examination in the elementary stage at least, and for the full certificate in the Honours Grade in the advanced stage at least, in two of the following science subjects: Machine construction and drawing, applied mechanics, light and heat, inorganic chemistry, organic chemistry, geology, metallurgy, steam.

Among the books of reference recommended to the candidates are "King's Treatise on Coal Gas," Newbigging's "Gas Manager's Handbook," Dibdin's "Practical Photometry," Cripps's "Guide-Framing of Gasholders," Hartley's "Gas Analyst's Manual,"

Wanklyn's "Gas Engineer's Chemical Manual," and Thorpe's "Quantitative Analysis."

The programme contains the rules and regulations applicable to the examinations, a syllabus of the subjects, a list of the registered teachers therein, the papers set last year, and lists of prizes and prize-winners. It may be obtained (price 8d., post free), as well as any further information, on application to the City and Guilds of London Institute, Examinations Department, Exhibition Road, London, S.W.

BRADFORD CORPORATION GAS AND ELECTRICITY SUPPLY.

Half-Yearly Financial Statement—Tenders for Coal—The Extension of the Electric Lighting Works.

At the Quarterly Meeting of the Bradford Town Council last Tuesday—the MAYOR (Mr. W. Oddy) presiding—the Gas and Electricity Supply Committee submitted their minutes, which included resolutions recommending that the necessary works required in the application of the three-wire system of electric lighting should be proceeded with, at an estimated cost of £2020; that the offer of the Westinghouse Electric Company, Limited, for the use of Dr. Hopkinson's patent in connection with the three-wire system, at the rate of £2 10s. per annum per ton of copper actually laid down, should be accepted; and that the tender of Messrs. Siemens Brothers and Co., Limited, for supplying and fixing two Willans engines, with Siemens dynamos, and two switch-boards required in the extension of the electricity works, for the sum of £3025, should also be accepted.

Alderman F. PRIESTMAN, the Chairman of the Committee, in moving the confirmation of their proceedings, made his usual statement as to the financial results of the working of the two departments during the past half year. Referring first to the gas revenue account, he said that they had carbonized coal which had cost £420 less than in 1892. They had saved in the carbonizing wages no less than £2226; this being largely due to improved machinery. The repair of retorts had cost £1080 more than in the corresponding period of the previous year; the reason being that the work was better in hand. The repair of mains and services showed a saving of £284, which was a smaller figure than there had been for a great number of years. Cartage and yard labour had cost £327 more than it did a year ago, mainly owing to the increased cost of tipping ashes, but partly in consequence of the labour necessitated by the lamentable explosion in the early part of the year. The public lamps and lighting had cost nearly the same as they did in 1892; the amount being £3331. Bank interest and commission showed an increase of £272; interest on loans, a diminution of £300; and bad debts, an increase of £263. The total expenditure was £92,431, against £95,640 in the corresponding half of last year. On the other side, the Corporation had received £2610 less for gas (which was due to an alteration in the date of sending out the accounts); £277 less for coke; and £312 less for tar, the price of which had fallen abnormally low, and 200 or 300 tons of which were wasted by the explosion. On the other hand, the price of sulphate of ammonia had steadily increased throughout the year; and chemicals had realized £1000 more than in the corresponding half of last year. The credit side of the balance sheet showed a total of £91,310, or a net loss on the six months of £1121; while the June half of last year showed a net profit of £2156. This difference was accounted for by the losses on tar. But it must be remembered that the borough was lighted for nothing; and it might be reckoned that, apart from interest and sinking fund, there was really a profit of £7000 or £8000. Almost everything expended had been placed to revenue account. The capital account showed the total outlay on the department to be £601,769. The other side of the account consisted of loans repaid and debenture stock received, amounting to £604,210, and leaving unexpended only £2440. The Chairman then proceeded to allude to the tenders for coal, and said that the Council were asked to purchase 180,000 tons, the average reduction on which was 1s. 5d. per ton. In the next twelve months, the Corporation would use from 150,000 to 160,000 tons; so that from this source alone there ought to be an increase of profits to the extent of nearly £10,000. The sulphate market appeared to be advancing still; and there was every prospect of the price rising considerably higher than it had stood at for a number of years past. The work sanctioned by the Council at the Birkshall Gas-Works was now practically complete; and the work in Valley Road, necessitated by the explosion, was going rapidly forward. The new tar-well, he thought, would hardly be ready for the coming winter; but in the meantime precautions had been taken by placing the large pipes from the retorts overhead instead of underground, to remove entirely the possibility of a similar explosion to that which had already occurred. Altogether, he thought the works had never been in better order than at present, and that the future of the Gas Department had never looked brighter. Passing on to the Electricity Department, he said that the credit side showed a total of £4547, against £3381 in the first half of 1892. On the debtor side, the total was £2253; leaving a gross profit for the half year of £2293, as against £1673 in 1892. Of this balance £771, or an increase of £135, had been set down to interest on loans, and £827, or an increase of £250, to sinking fund. There was a net profit of £625, against £387 in 1892. The general balance-sheet showed a total expenditure of £62,109; and a balance on the right side of £915, which would be set against depreciation of plant, although it had been particularly well kept during the past year. There were resolutions before the Council recommending a further expenditure of about £6000. This was absolutely necessary to keep pace with the time. In fact, he felt that the Committee had not really kept pace with the requirements of the day. They had had to refuse a large number of applications; and he believed that, if they had double the quantity of electricity to sell, customers would quickly be forthcoming for it. The Committee had held back, because they thought it desirable to ascertain whether they could improve their system; and they had consulted Lord Kelvin, who had recommended the three-wire system. His Lordship also said that, if the Corporation had to begin again to-day, they could not adopt a better plan than they did five years ago. He hoped the Committee would be able to get one of the engines which they proposed to order running before the winter set in; otherwise they must face the winter with some apprehension, because the work put on the engines and plant last year was more than it was safe for them to carry.

Alderman MORLEY seconded the motion, which was agreed to.

THE FINANCES OF THE SALFORD CORPORATION GAS AND WATER DEPARTMENTS.

The statement of accounts of the Salford Corporation for the year ending March 25 last has been issued. It contains full details of the capital and revenue accounts of the Gas and Water Departments, together with the report on the accounts by Messrs. Russell and Walmsley, the professional Auditors.

In their report on the finances of the Gas Department, the Auditors state that the net profit to be handed over to the district fund is £4408; being an increase of £583 on the previous year. The revenue account shows a gross profit for the year of £38,194; being more by £1113 than in the preceding period. This is made up as follows: Increase in sale of gas and rentals, £4400; less decrease for residuals (£2664) and rents (£49), £2713; leaving £1687. Deducting the increase in expenditure, £2772, less the decrease in the manufacture of gas, £2198, there is left a total of £574, which, deducted from the above-mentioned £1687, leaves £1113. Against this there is an increase of £330 on the interest account, and of £199 on the sinking fund account—together, £529—leaving a net increase of available profit, in round figures, of £584. The sum of £8481 has been received from the Borough Consultative Committee, and transferred to the district fund. There was added to the capital account during the year the sum of £16,976; and, in addition, £11,721 on works and plant and £1568 on hired meters account were expended and paid out of depreciation fund, of which a large proportion was for alterations at the Liverpool Street works. The sum of £10,000 on depreciation has been charged to profit and loss, and added to the depreciation account; but no depreciation has been taken this year, nor for several years, off the hired meters account. The same amount as last year for depreciation has been charged this year against the profit.

Turning to the detailed accounts presented by Mr. S. Y. Shoubridge, the Corporation Gas Engineer, we find that the additions to capital are set out as follows (omitting shillings and pence): Buildings, plant, storeage works, &c., £13,513; new mains, service-pipes, &c., £1968; new meters, £1002; stoves on hire, £491. At the end of the financial year, the total expenditure on capital account was £584,652. Of this sum, buildings, plant, storeage works, &c., represented £437,420; mains and service-pipes, £169,871; meters, £41,126; and stoves, £2235. The net addition last year to the amount owing by the Corporation on loans was £43,173. The total indebtedness under this head in March last was £428,067; while the amount represented by annuities capitalized at 25 years' purchase was £63,250. These items together make a total of £491,317; leaving a credit balance on capital account of £93,335. The revenue account contains the following principal items of expenditure: Coals, £60,506; wages, £17,483; purification, £2465; salaries of superintendent and analyst, £536; repairs, £8689; distribution, £4394; management expenses, £5377; other items making a total of £109,274. The following are the receipts: Sale of gas by meter, £105,292; public lighting, £14,349; rental of meters, £3833; rent of stoves, £201; coke, £12,212; tar, £4554; ammoniacal liquor and sulphate of ammonia, £6867; rents, £159—total, £147,468. The balance carried to the profit and loss account is £38,194.

With regard to the water-works fund, the Auditors' report states that the amount of surplus receipts for the year is £5848—an increase of £482 on the previous year. The gross profit on the revenue account is £8401—an advance of £1158. This was decreased in the profit and loss account by an increase in interest and contribution to the sinking fund of £676; making an increase in the net profit of £482. During the past year additions amounting to £230 were made to the capital expenditure, which now amounts to £61,557; while the amount owing as loan mortgages is £47,377—leaving a balance on capital account of £14,180. The revenue account shows that the Salford Corporation paid £13,738 to theManchester Corporation for water. Of this sum, £6500 was for 1,500,000 gallons daily; £2279 for 500,000 gallons daily at 3d. per 1000 gallons; and the balance (£4959) was for "extra supply." The other items of expenditure, including salaries, wages, rent and taxes, repairs, and miscellaneous expenses, amounted to £4223. The total expenditure charged to revenue account was £17,962. The income was £26,363, of which £26,348 was for water-rents, £315 for meter-rents, and £697 for work done for owners of property. The report also explains how the gross profit of £8401 was dealt with.

Projected Extension of the Ashford Water-Works.—The Ashford Local Board have resolved to make an extensive enlargement of their water-works; and a new reservoir is to be constructed. In 1881 the water supply was limited to 706 houses, and at the present time the same works are trying to supply 1728 houses; while the water-rents have risen from £995 in 1883 to £1700 in 1893. Notwithstanding these increases, and the fact that Ashford is still a growing town, opposition is being threatened to the scheme.

The Finances of the Stockton and Middlesbrough Water Board.—The Stockton and Middlesbrough Water Board have decided to pay out of the net revenue to the constituent authorities the sum of £18,000 in the following proportions: Middlesbrough, £9000; Stockton, £7500; and Thornaby, £1500. They have also decided to issue precepts to provide for expenditure, as authorized by their Act of 1876, as follows: Middlesbrough, £42,000; Stockton, £35,000; Thornaby, £7000—total, £84,000. This amount is to be paid in instalments between the present time and December.

THE CRISIS IN THE COAL TRADE.

As remarked in our editorial columns last week, the most important phase in the recent development of the strike movement among the coal miners is the disaffection manifested among the men in South Wales. On the 10th inst., upwards of 2000 miners ceased work in the Blaenavon, Glyn, and Rhondda Fawr districts, and 3000 additional men were idle in the Abercarn district. The hauliers formally served notices upon the coalowners, demanding an advance of 20 per cent. in their wages; and the masters endeavoured to bring in other men to meet the current requirements. At a mass meeting of colliers employed at the Celynen and Abercarn collieries, it was agreed to insist on a 20 per cent. advance outside the scope of the sliding scale. On the following day, a mass meeting of the colliery workmen of Glamorganshire and Monmouthshire was held at Tredegar Junction, and was attended by upwards of 2000. It was resolved—"That this meeting of the workmen at the various collieries in Monmouthshire denounces the demoralizing effects of the sliding-scale agreement, and feels justified in demanding an advance of 20 per cent. outside its scope." It was also resolved that no workmen at any colliery should agree to any settlement without the sanction of the mass meeting; and, further that, if any workmen were victimized in the dispute, work should not be resumed until he was reinstated. A Committee appointed at a previous meeting afterwards met and decided to draw up a draft memorial setting forth the demands of the men, to be forwarded to the Secretary of the Sliding-Scale Committee after being submitted to a mass meeting of the miners of South Wales to be held at Pontypridd. Mass meetings of strike hands were held in various districts on the 12th; and resolutions were unanimously adopted to stand firm against the coalowners, and not resume work until miners and hauliers received all round an advance of 20 per cent. Large bands of hauliers invaded the districts where the miners had already resumed work at 1¼ per cent. wages advance under the sliding scale, and induced the men to come out on strike, and insist on larger advances in their rates. The result was that several thousand additional miners struck work. Upwards of 50,000 men were idle; and a severe struggle for ascendency prevailed between the Federation miners and those working under the sliding scale. An important conference of South Wales and Monmouth coalowners affected by the stoppage of associated colliers was held at Cardiff, under the presidency of Sir W. T. Lewis. The proceedings were private; but it was understood that a firm attitude was assumed by the owners—it being stated that they were determined to insist upon the whole of their workmen strictly carrying out their engagements under the sliding-scale agreement.

The past week opened with the holding of the mass meeting at Pontypridd, which, as stated above, had been arranged for. Something like 30,000 men were present; and resolutions were passed calling for a general strike for an advance of 20 per cent., and requesting tradesmen not to give credit to men continuing at work. The meeting declined to hear members of the Sliding Scale Committee. It was estimated that upwards of 60,000 men were not at work; and intense excitement prevailed in the various districts. At the Lloyd Collieries, a descent was made upon the mine by a crowd of several thousand miners, to the utter consternation of the managers and workmen. The mob demanded the stoppage of the collieries, and took possession of the pit bank. Upwards of 800 collieries were in the mine at the time; and, in order to ensure the safety of the men below, the managers complied with the demands of the strikers, and all the men were wound to the surface. A mass meeting was subsequently held; and it was decided to resume work on the following day, provided ample military protection could be secured. Formal applications were thereupon made to the Chief Constable and to the military authorities. At Bridgend, the Magistrates read the hauliers a severe lesson by fining sixty of them £5 each for leaving their employment without notice. Nevertheless their fellows in the Aberdare Valley were not deterred from following a similar course. In that district, there were stopped, at the beginning of last week, six collieries, employing about 6000 hands. The position did not improve as the week went on. By Wednesday night, as far as could be gathered, the only pits of importance at work were those at Rhymney—the men at Cyfarthfa having come out. There was considerable excitement in the Rhondda Vach Valley. Several hundred strikers, many armed with sticks, made a demonstration at Cileli Colliery, and, despite the representation of the manager that the pits were worked entirely for the supply of the Great Western Railway Company, they refused to permit the 200 men employed there to continue working. The strikers then proceeded up the Dinas Mountain for Clydach Vale on a similar mission. A company of the Second Devon Regiment, comprising about a hundred men, were sent from Devonport to Blaenavon, where, on Wednesday morning, great excitement prevailed on its becoming known that a body of men from other districts were marching into the town with the object of dissuading the men employed in the Blaenavon Company's collieries—1500 in number—from resuming work. Thousands of men, headed by brass bands, poured into the town at an early hour of the morning. The strikers were successful in the object they had in view, the whole of the Company's employees abstaining from going down the pits. A meeting of the Blaenavon men was afterwards held; and a resolution was adopted to throw in their lot with the men of South Wales and Monmouthshire. A mass meeting, at which some 10,000 were present, was subsequently held. The action of the Blaenavon men was vociferously applauded; and resolutions were passed unanimously in favour of adhering to the decision come to at the Pontypridd meeting, and agreeing to support any men who might be victimized for taking part in the strike. The action of the Ebbw Vale men in asking their employers to provide them with police and military protection was warmly condemned; and the meeting pledged itself to abstain from acts of violence during the struggle. A mass meeting of colliers and hauliers in the Aberdare Valley was also held, when the Chairman declared a resolution carried to continue the strike until an advance of 20 per cent. was granted. A large number, however, voted against the proposition; and the ruling of the Chairman was questioned. This may possibly have been the result of the divergence of views exhibited at a meeting of delegates on the previous evening, when 521 voted in favour of working, against 121 who wished to cease work, and 130 who were neutral. Before the voting took place, a resolution was passed unanimously that the majority should govern the minority; but as soon as the voting was found to be in favour of working, the Aberaman and Fforchaman hauliers declined to be bound by the resolution, and insisted upon not working. The men at the Mardy Colliery (which had been visited by a crowd of between 4000 and 5000 strikers) were almost unanimous for working, and were anxious to do so if proper protection was afforded them. The employers expressed their determination to put an end to the wholesale intimidation which had been practised in South Wales since the strike began; and summonses were taken out in respect of three men who, it was alleged, were afraid to go to work in consequence of the threats used against them.

Thursday morning saw the commencement of rioting at Ebbw Vale; and the situation in the valley became grave. As early as six o'clock the troops arrived from Blaenavon, whither they had gone the previous day; and they were strengthened by a force of police. Shortly afterwards, the strains of a brass band were heard, and subsequently a procession of strikers was seen approaching. At Waunypound they stopped, and formed themselves into a mass meeting on the hillside. Thousands of Ebbw Vale workmen, headed by the steel-works men, all well armed with sticks and staves, proceeded to the place of meeting, and joined the assembly. Several speeches were delivered; the strikers stating that all they wanted was the support of the Ebbw Vale men. The Chairman (a Blaenavon man) admitted that the movement had begun wrongly; but it had now, he said, assumed large dimensions, and all they had to look forward to was higher wages. The Ebbw Vale men, not being allowed to give their reasons for continuing work, withdrew from the meeting. The strikers threatened to return in larger numbers and take vengeance. This had the effect of exasperating the Ebbw Vale men, who rushed towards them with a great cheer. The attack was well organized; and the strikers commenced to beat a hasty retreat, followed by the Ebbw Vale men brandishing their sticks. The intruders could not manage to escape their pursuers; and they were clubbed right and left. No Ebbw Vale men were injured; but the whole district was in an uproar of excitement. At a mass meeting of the Rhymney colliers held on Thursday, resolutions were passed expressing willingness to return to work if the hauliers' dispute could be settled, and proper protection afforded; condemning the action of the hauliers as illegal and demoralizing, and the intimidation resorted to to prevent men working; and approving the sliding scale as the best method of regulating wages.

The interest in the strike centred on Friday in two meetings which took place at Cardiff. The first was held by the Coalowners' Association; and several important matters were discussed. It was decided that on the following day they would withhold the hauliers' wages, on the ground that the men had broken their contract. It was also resolved that a deduction should be made from the colliers' wages equal to the value of the tools they have in their possession. It was expected that this course would lead to serious complications in the colliery districts of South Wales and Monmouthshire; and the question of providing for the preservation of the peace and the protection of property next occupied the attention of the owners. A communication was made to the Home Office with the view of obtaining increased police supervision and the assistance of the military. The second meeting was held by the Joint Sliding-Scale Committee, at which the Chairman (Sir W. T. Lewis) informed the workmen's representatives that the whole of the employers embraced in the Monmouthshire and South Wales Coalowners' Association were determined to require the workmen, so long as they were in their employ, to fulfil the portion of the contract, entered into after much deliberation, for the continuance of the sliding scale in February last. A discussion ensued; and subsequently, in deference to the representatives of the men, the masters gave up the point in regard to the tools, on the understanding that the workmen were not to consider such a concession to free them from their engagements under the sliding-scale agreement, nor was it to be considered in any sense as a precedent. The miners' representatives on the Committee issued a lengthy manifesto to the men, in which they dealt with the history of the agreement, and, in conclusion, stated: "We cannot honourably encourage any attempt to violate the agreement that we have signed at your request, and, moreover, it becomes our duty to ask you, in the interests of yourselves and families as in the interests of the trade, which has already suffered almost irreparable loss, to resume your work at the collieries, and honourably carry out the obligations which you entreated us to enter into on your behalf." At Swansea and Neath, matters had reached a serious point on Friday. At most of the collieries in the district, the men had ceased working; and, in consequence, the greater portion of the tinplate, copper, steel, and iron industries had intimated their intention of stopping. The collieries of Lord Swansea and Messrs. Glasbrook, at Morriston, were under police protection. A third of the Ebbw Vale Company's colliers had returned to work. They were escorted to the pits by military and police, without any molestation on the part of the strikers of the adjacent valleys. The Company announced their intention to support the men at any cost; and it was arranged that the military and extra police would remain in the district until the dispute was settled.

Owing to the prompt measures taken by the Emergency Committee of the South Wales coalowners to protect the men who are willing to work in the associated collieries, something like 1100 soldiers and a large force of police were distributed over the district on Saturday. Consequently, the Dowlais, Merthyr Vale, and Ebbw Vale colliers were able to go to and from their employment unmolested. In the Avon Valley, however, the men employed at the Tewgoed and Argoed Collieries were induced not to go to work. In several districts, works were being stopped for want of coal; and the Pontypridd Gas Company gave notice that they would be unable to supply gas after yesterday. At Cardiff on Saturday, the owners' representatives on the Sliding-Scale Committee issued a manifesto declaring the determination of the employers not to entertain any departure from existing contracts with their workmen under the scale.

Turning to the North of England, the result of the ballot among

the Northumberland miners as to whether or not they should strike in support of their demands for an advance of 16¼ per cent. was a majority of 1600 against a strike. Between 13,000 and 14,000 miners voted. A majority of two-thirds in favour of a strike would have been necessary before a struggle could have been entered upon. As a consequence of the result of the ballot, the Northumberland Miners' Association are virtually expelled from the Federation. It is not long since Northumberland joined the organization, the majority in favour of this course being 923; but on that occasion 1000 fewer miners voted than in the ballot just declared. At a conference of miners' delegates in the Lancashire and Cheshire district, held last Saturday at Wigan, it was resolved that, at the Federation conference to be held in London to-day, the delegates of the district should favour the suggestion that the men shall return to work at the old rate of wages, with the understanding that no advance be asked for till the 1891 level of prices is again attained. In the colliery districts round Manchester, the strike goes on without any disturbance of the peace.

Meetings of the Derbyshire and Seen Valley colliers were held in various parts of the district last Saturday, and the opinion was expressed that at to-day's conference arrangements would be made for ending the struggle. It is stated that, in the Midlands, masters employing 50,000 men are willing to resume on the old terms. If the conference decides to allow the men to go back, it is expected that other coalowners will give way rather than allow some pits to enjoy trade at famine prices. The feeling among the men, however, against any concession is very strong.

It may be interesting to quote here some statistics recently adduced by the President of the Manchester Chamber of Commerce with regard to the coal industry and the present dispute. It appears that the coal exports for the year ending June 30 last amounted to 30,000,000 tons, and the home consumption to 150,000,000 tons; making a total of 180,000,000 tons. The standard rate of wages, at 3s. 4d. a ton, would yield £30,000,000; and adding the 40 per cent. advances which had been obtained during the past few years, there would be a sum of £12,000,000 sterling. The masters proposed to take off 25 per cent., not reckoning from the present rate of wages, but from what was called the basis standard before any advance whatever was made. The 15 per cent. which would thus be left out of the 40 per cent. would give the men £4,500,000 instead of £12,000,000 sterling; so that really the difference in the reduction of 25 per cent. amounted to £7,500,000. Taking the number of men and boys employed as miners at 600,000, the average amount received of the 40 per cent. advances was about £70 per annum; and with the proposed reduction it would be reduced to £57 10s. per annum. This reduction, if spread over the whole population of the country, would be 3s. 6d. per head on 36,000,000 of people. The exports of coal in 1888 amounted to 25,632,407 tons, and in 1892 they were 29,048,056 tons. This was an increase of about 13 per cent. in weight; while the value, which was £15,820,180 in 1892 and £10,603,617 in 1888, showed an increase of more than 50 per cent.

THE BRITISH INSTITUTE OF PUBLIC HEALTH.

The Annual Congress in Edinburgh.

In the JOURNAL last week, we gave abstracts of some of the papers read at the above congress, the President of which was Dr. H. D. LITTLEJOHN, the Medical Officer of Health for Edinburgh. A few additional matters which occupied the congress claim attention; and these we will now briefly notice.

The subject of the "Filtration of Water Supplies and Sewage Contamination" was introduced by Dr. Cartwright Wood, of London, in the Preventive Medicine Section. In the course of his remarks, he stated that a Royal Commission had been investigating the Metropolitan Water Supply; and, from the evidence given, it would appear that the view which was presented to them, as regarded water contamination, was very different from that which had been previously held in this country. They appeared to regard the question from a purely scientific point of view, and concentrated their attention to tracing the organisms which might find their way into the water along with the sewage contamination. The question resolved itself into a purely bacteriological one; and he protested against the use of bacteriology towards the solution of so important a matter. They might rely on the destructive action of sunlight on putrefactive organisms; and the small number of disease germs which would be imbibed by one person might be rendered innocuous. But to adopt such views as these as tending to minimize the importance of sewage contamination would inevitably be to encourage the further pollution of the great natural watercourses, and arrest the purification of the rivers. As regarded sand filtration, he said it must be borne in mind that it did not at once exert its full action.

In the Sanitary Engineering Section, Mr. J. M. Gale, M.Inst.C.E., Engineer-in-Chief to the Glasgow Corporation, read a paper on the "Loch Katrine Water-Works." The works for the supply of the city of Glasgow with water from Loch Katrine were, he said, designed in 1854. The scheme appeared to many to err largely on the side of excess; but only 25 years had elapsed from the time the water was brought into the city when it became apparent that an additional supply would have to be immediately provided. The assumptions both as regards increase of population and quantity consumed per head had fallen greatly short of the realized facts. The valley contained Lochs Vennachar, Drunkie, Achray, and Katrine, the drainage area of which was 74·8 square miles, and the area of the lochs 6·6 square miles. Loch Katrine was the highest of the lochs, and it alone was devoted to the supply of the city; the lower lochs being reserved for maintaining the supply of compensation water to the River Teith, which amounted to 40½ million gallons per day. The water was of exceptional purity; and, notwithstanding its great softness, no case of lead-poisoning through using it had ever been reported. In 1885 an Act was obtained for a large extension of the works. These consisted of (1) another aqueduct from Loch Katrine; (2) increased storeage and gathering-grounds at the loch; (3) an extra service reservoir; and (4) additional mains from the reservoir to the city—thus, in fact, duplicating the first works. An ultimate supply of 100 million gallons of water per day was provided for. In determining the amount of storeage it was necessary to provide at the lochs, it was found that, by raising Loch Katrine 5 feet, and Loch Arklet (which flows into Loch Lomond) 25 feet, the supply would be increased to 75 million gallons per day. When raised, Loch Katrine would contain 140 days' supply, and Loch Arklet 175 days' supply, of the quantity to be drawn from these sources, including compensation water. The total storeage in the lochs would then amount to 15,000 million gallons. The additional 25 millions to complete the scheme for 100 million gallons per day could be obtained from the northerly branch of the River Teith. The parliamentary estimate for these works and for the service reservoir was £1,150,000. But they presented the unusual feature that their execution could be spread over a lengthened period of time; and, with the consent of the principal landed proprietors, no date was fixed by the Act for their completion. At present one-third of the new aqueduct was completed and in use; and the supply of water had been increased by 4½ million gallons per day. Two other portions, amounting together to half of the whole, would be completed in about eighteen months. The construction of the remainder had not yet been entered upon. The additional mains to the city would be completed in a year, and the new reservoir in two years from this time. The raising of the level of Loch Katrine would probably not be entered upon till the consumption of the city reached 50 million gallons per day. The revenue derived from the supply of water had increased from £60,000 per annum in 1856-57, when the Corporation first undertook the supply, to £170,000 last year; while the domestic water-rate within the city had been reduced from 1s. 2d. to 3d. per £1 of rental.

Mr. A. Leslie, M.Inst.C.E., the Engineer-in-Chief to the Edinburgh Corporation, followed with a paper on the "Edinburgh and District Water-Works." He said the water supply of the city of Edinburgh was derived from two main sources in almost equal proportion—viz., the Pentland Hills and the Moorfoot Hills. Previous to the introduction of these supplies, the inhabitants depended entirely on wells situated within the city. Authenticated accounts of the water supply to Edinburgh dated as far back as 1621, when steps were taken for the introduction of the first gravitation supply. The supply from the Pentland works was peculiar, inasmuch as it consisted almost entirely of spring water, which rendered unnecessary the construction of large and expensive storeage reservoirs. After giving a short history of the Edinburgh Water Company, the author said that in 1869 an Act was passed for taking over the works of the Company, and investing them in a public Trust, consisting of representatives of Edinburgh, Leith, and Portobello. The first proceedings of the Trust consisted of an application for power to introduce the water of St. Mary's Loch; but it was ultimately decided, in deference to the wishes of the ratepayers, to adopt the Moorfoot or South Esk scheme. This scheme consisted in the utilization of a drainage area, amounting to about 14,500 acres. It was laid out upon the assumption that compensation should be provided in the proportion of one-third of the yield of the district operated upon—leaving two-thirds of the yield for town supply; and reservoirs had been provided having storeage equal to six months' yield of the districts. The rest of the paper was taken up with descriptions of the various reservoirs and other works necessary for bringing the water into the city; special mention being made of the filter-beds at Alnwickhill. In conclusion, the author said that in Edinburgh the consumption of water was 37 gallons per head per day. Until lately it was 42 gallons; but, by repairing the distributing plant and checking waste, it had been reduced to about 37 gallons.

In the discussion to which the papers gave rise, Mr. J. D. Watson, of Aberdeen, asked how it was that the inhabitants of Scotland required so much water. He said that in Glasgow the consumption was equal to 50 gallons per head per day; while in Edinburgh it was 37 gallons. Very recently he had had occasion to make an average of the quantity of water consumed in the large towns of England; and he found it amounted to 28 gallons per head per day. Alderman Hart, of Canterbury, said in that town they considered 20 gallons per day for each individual quite sufficient. Mr. Gale, in reply, said it was very difficult to form an opinion as to the quantity of water required for different towns, as the circumstances varied so greatly. A number of cities in England had no water-closets; and then there was the use of hot water in the houses. In Glasgow they had a great deal of this. Then the number of baths had to be taken into consideration, and also the quantity of water required for trade purposes. Again, in Scotland the people lived in flats, and water had to be supplied to each flat; so that the leakage was very great. Mr. Leslie said from the 37 gallons per head per day consumed in Edinburgh had to be deducted 14 gallons for trade purposes. He added that in Edinburgh there were great facilities for using and also for wasting water.

In the section of Chemistry and Climatology, Mr. J. Aitken, of Falkirk, read a paper discriptive of the instruments invented by him for observing atmospheric dust. After explaining, and illustrating by experiment, his view that moisture condenses upon dust particles to form fog or cloud, he went on to state that he had arrived at the conclusion that vapour could condense where there was no dust. The particles so formed would not, however, come down in gentle drops, but in enormous masses of water. He therefore ventured to assert that, if it were not for dust, there would be no fog. He performed an experiment with two gas globes exhausted, into one of which he introduced vapour from a paraffin lamp, which had no affinity for water, and into the other vapour from a gas-flame with a little sulphur, which had an affinity for water. The sulphurous vapour showed by far the densest form of condensation. In the case of the lamp, he pointed out that condensation rapidly thinned and fell; whereas in the case of the gas-flame, it remained dense. The bearing of the experiment was on the question of coal burning. They had, he said, a great many nostrums in the present day about getting rid of fogs; but so long as they did not get rid of sulphur, they would not be free from fogs—they would simply disperse the smoke in the fog. Even if they had a perfectly clear fire, they might find what he called the most persistent form of condensation—the sulphur. For this reason, it seemed to him to be hopeless ever to expect to prevent fogs by perfect combustion, unless, at the same time they did something to get rid of the sulphur. The question was asked whether the practice of burning charcoal in Paris accounted for the smaller number of fogs there.

Mr. Aitken said his opinion was that many things went to make fogs permissible; and the Seine Valley seemed to be different from that of the Thames. For one thing, the amount of sulphur in it was very much less. There was a complaint in Paris that fogs were becoming more common. This might be due to the increased use of coal; but they had no information to enable him to come to a conclusion on this point. The Chairman of the Section (Professor Crum-Brown) said that Mr. Aitken had shown them a great amount of fog by burning sulphur; and it occurred to him that this must be on account of the oxides introduced into the air. But the strange thing was that the sulphur acids did not produce this; and so it must be owing to some solids or liquids generated in burning, and not to any volatilized particles. It seemed to him to be not at all likely that it might be due to sulphurous acid. But it was a chemical experiment which almost failed because of the very small quantities that were necessary to produce the effects which Mr. Aitken had shown.

The next paper was by Dr. T. Ewan and Dr. Bailey, of Manchester, "On the Solid Impurities of the Air." It was read by Dr. Ewan, who explained that it embodied the results of investigations carried on during the last three years by the Air Analysis Committee of the Manchester Field Naturalists' Society. Referring incidentally to the theory just advanced by Mr. Aitken, he mentioned that they found in Manchester that, during a dense fog, there was ten times as much sulphurous acid in the air as in ordinary circumstances. The effect of atmospheric impurities on the light was shown by the fact that in ordinary circumstances the town had only about half the light received by the suburbs; and a moderately dense fog cut off at least 95 per cent. of that. Dealing with the question of the presence of bacteria in the air, he exhibited a diagram graphically representing by curves the relation of the number of bacteria to the strength of the sunlight. This showed the bacteria curve to be almost exactly parallel with the curve representing the mean amount of direct sunlight—a result which appeared to be in contradiction to the results obtained by former observers, which pointed to the destructive effect of sunlight upon bacteria. The only explanation Dr. Ewan could suggest was that the bacteria which formed the subject of his investigations were innocuous. In the course of the discussion on the paper, Mr. Aitken propounded the suggestion that, as the sunshine heated the air, it would rise, and the bacteria would rise with it to the point where the observations were taken. Dr. Ewan, however, stated that the room where the experiment was made had a north aspect.

The other papers which came before the section were: "On the Pollution of Streams by Paper-Making Discharges, and the Methods Employed for the Arrestment of such Pollution," by Dr. Stevenson Macadam; "Water Pollution from Natural Causes," by Mr. Irvine; and "An Improved Method of Sewage Precipitation," by Dr. Purvis.

Dismissal of a Gas Official at Beverley.—At the meeting of the Beverley Town Council on Monday last week, the Gas Committee reported that they were satisfied that one of the officials had for several years obtained large supplies of gas direct from the main without payment; and they recommended that he be forthwith dismissed from all the offices held by him under the Corporation, and without prejudice to any proceedings the Council might think proper to take against him. Mr. Alderman Hobson, the Chairman of the Committee, in moving the adoption of the report, said it appeared that, on the appointment of the person in question in 1875, he had been allowed free use of a light for his office; but since then he had employed it in different parts of the house and for a cooking-stove. The official had been before the Committee, and had failed to give a satisfactory explanation. The Town Clerk (Mr. J. Mills) read a letter from a solicitor on behalf of the official referred to, in which the latter indignantly repudiated the insinuations of dishonesty, and reserved the right to vindicate his character in a Court of Law or otherwise, as he might be advised. The report was adopted.

The Proposed Amalgamation of Water-Gas Undertakings.—An extraordinary meeting of the British Water-Gas Syndicate, Limited, was held last Friday, for the purpose of confirming the resolution passed on the 20th ult. in favour of amalgamation with the North British and the Yorkshire and Lancashire Water-Gas Companies, Limited. The necessary motion was formally proposed by the Chairman (Mr. Samson Fox), and seconded by Mr. T. Proctor. An amendment was moved by Mr. Leah, expressing the opinion of the shareholders present that, after the experiences of the last few years' working, and the total failure for all purposes of the use of water gas, resulting in the entire loss of the Company's capital, "it would be an iniquity and a shame to use any further public money for this purpose;' resolving that the resolution for amalgamation with any other company be not confirmed; and appointing a Committee to investigate the formation and working of the Company, and to take the necessary steps for winding up the business. In support of his amendment, he said he was sorry the Directors felt driven to come before the shareholders with such a policy as they now offered. It was not because they had a scrap of evidence of the slightest chance of ever making any progress or profit in the undertaking. Over £500,000 had already been lost in the attempt; and, after a period of more than four years, they were unable to show a single instance of success for any business or purpose to which they had applied the water-gas patents. Although this fact was well known to the Chairman and the Directors, they had the effrontery to apply for further money to continue this swindle in the light of day. The Chairman objected to the use of the word "swindle," and also to a subsequent reference by the same gentleman to Monte Carlo; and, after a little discussion, both of the offensive terms were withdrawn. The amendment was seconded; and then the Chairman remarked that they were simply met together to confirm a resolution agreed to at a previous meeting; and the proxies from the shareholders were as great in number as they were then. The whole of the property-holders were still agreed that the scheme propounded and carried was the best way out of the difficulty. The value of the project had been interfered with to such an extent by the clap-trap sent forth by such men as Mr. Leah, that he had injured his own property and everybody else's. Only three hands were shown in favour of the amendment; and the resolution was carried.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Though this is the "holiday month," the Edinburgh and Leith Gas Commissioners were called together on Monday last to transact some necessary business. One of the chief items before them had relation to the introduction of the Peebles process of making gas from oil. Regarding it, Mr. Kinloch Anderson, the Convener of the Works Committee, stated that the Committee had that morning had before them the terms of the royalty upon the process, and thought them rather high. They, therefore, proposed to take time to discuss the matter, and would not report until they had considered what the effect would be upon the price of gas. Another subject which they had before them, was the application by the Corporation of Edinburgh for a supply of gas with which to drive engines for the electric lighting installation the Corporation propose to put down, on the same terms as the Commissioners supply gas for the public lamps. In the Committee the recommendation was adopted that gas be supplied to the Corporation on the same terms as to discount as other large consumers enjoy. Speaking to this recommendation, Bailie Archibald said they wished to treat the Corporation of Edinburgh fairly, and would give them the same terms as the Board of Works and the Railway Companies get. The highest rate of discount was 10 per cent. for accounts amounting to £800 and upwards, which was equal to a reduction of 4·6d. per 1000 cubic feet. The charge for gas consumed in the public lamps was 1s. per 1000 cubic feet less than to ordinary consumers. He thought the sound business policy was that contained in the recommendation of the Committee; but if it should turn out that a large quantity of gas was taken, it might be a question whether an abatement might not be given to the Corporation. Mr. Kinloch Anderson moved that they delay coming to a decision until an estimate could be prepared as to the quantity of gas likely to be consumed. This proposal appears to me to have been dictated by the expectation that, in a larger meeting, more support might be obtained for the minority who favoured the granting of the application. Some of those who voted for Mr. Anderson's proposal held up the "bogey" that the Corporation might adopt steam as the motive power, in which case the Commissioners would lose a good customer. The argument, however, did not prevail; and the Commissioners accepted the recommendations of their Committee by ten votes to six. This resolution was really the only one which the Commissioners could, with reason, have adopted; because the citizens of Leith as well as those of Edinburgh are their customers; and had they sold gas to the Edinburgh Corporation without profit, they would have been taking a contribution from Leith for the support of the Edinburgh electric lighting installation. It is bad enough when the gas consumers of a locality have to bolster up electric lighting ventures in their own midst, without having adventurers from adjoining territories coming in to also blackmail among them.

The transfer of the undertaking of the North Berwick Gas Company to the Town Council, which has been under negotiation for a long time, has been accomplished this week. The Arbiters, of whom Mr. James M'Gilchrist, of Dumbarton, represented the Company, reported, fixing the amount to be paid by the Corporation to the Company at £5145 1s. 9d. Provost Brodie said there was much reason for congratulation on so satisfactory a completion of the transaction; and he went on to predict (surely a rash thing to do, considering his want of acquaintance with the undertaking) a reduction in the price of gas at no distant date. This proceeding savours of a hallooing before the Council are out of the wood; and the Provost's sanguine anticipations may not be realized after it is discovered how much may be required to be expended upon the gas-works, either in renovating them or removing them to another site—the present one being not very suitable. The whole Council were appointed the Gas Commission.

Scotsmen are proverbially cautious; and the Aberdonian is credited with being the most cautious of all. I suppose it is the outcome of this quality which was manifested by the Peterhead Town Council on Monday, when, in the filling up of the post of Gas Manager, they subjected the candidates to both an oral and a written examination. There were 39 applicants for the post vacated by Mr. John Mackay; and from these the Council selected a short leet of four to be subjected to the ordeal of examination. It would never do for a town of the importance of Peterhead to be served in the capacity of Gas Manager by a man who was not in every way competent for his duties; hence the necessity for examining him. Peterhead is the most easterly town in the United Kingdom; and as the east is noted for its wise men, the councillors seem to affect that quality. With them the appearance which the candidates were able to make before them, or the recommendations and certificates by their friends, went for nothing, or next to nothing, as to the capabilities of the new Manager. It is not stated whether the examination was in reading, writing, and arithmetic, or in the weightier matters pertaining to gas manufacture. If the former, the examination would probably be a harmless one, unless the average Town Councillor in Peterhead be a more highly educated individual than his colleague in other towns usually is. If the latter, there is just a possibility that a body of men who consider themselves capable of directing the technical movements of a Gas Manager, might not be model employers for the Manager. It is to be hoped, for Mr. Kincaid's own sake, that the Council, having accepted him as duly qualified for his duties, will not hamper him in his discharge of them; but that he will be left to himself to do his work according to the light of the instruction he has received, and which (considering he has served under Mr. M'Gilchrist at Dumbarton) is of a very high order.

Before leaving Peterhead, Mr. John Mackay, the late Manager, was presented by the employees in the gas-works with a silver cigar-case, as a token of their esteem for him as an employer.

"Comparisons are odious," and probably in the whole range of human action the saying could not be more appropriately made than in connection with the conducting of a gas undertaking. The fact is so obvious that—I presume it is of common consent—the subject is seldom seriously raised. It has been raised, however, just now at the Greenock Police Board, with reference to the working of the Corporation Gas Department; and the town with which the comparison has

been made is Paisley. The question was raised by Dr. Cluckie, who, as Treasurer of the town, probably had his mind fixed upon the share of the gas surplus which was to be voted to the general purposes account, and who could not understand why it was that, with gas at 2s. 8d. per 1000 cubic feet in Paisley, there should be a surplus on the year's working of £4004, whereas in Greenock, with gas at 3s. 4d., there should only be a surplus of £57. When the question was brought up a month ago, it was considered of sufficient importance for inquiry; and a Sub-Committee was appointed to answer the problem which the Treasurer had raised. The report of the Sub-Committee—a rather long document—was presented on Tuesday. Beginning with the somewhat questionable proceeding of dragging in the affairs of the Paisley Gas Trust, instead of confining themselves to defending their own position, they asserted that the £4004 of surplus at Paisley was the amount before paying interest and contribution to the sinking fund; and that after these charges were met, the true surplus was £738 9s. Then they went on, in the same spirit, to state that in Paisley a larger quantity of coal was purchased than could serve for the current year; whereas in Greenock they had only purchased for the year's requirements. Also that, while in Paisley shales and splints had been purchased, in Greenock they had purchased more cannel. The difference in price was between 9s. 2d. in Paisley and 11s. 5d. in Greenock. Summarizing the results of their inquiry, the Sub-Committee came to the conclusion that the difference between the Paisley price of 2s. 10d. last year, and the Greenock price of 3s. 4d., could be accounted for as follows: Profit on the increased production of gas in Paisley over Greenock, 3d. per 1000 cubic feet; profit on the increased return from residual products, ¾d.; extra railway haulage, ¾d.; loss on public lighting in Greenock, 1d.; loss on meter-rents not charged in Greenock, 1¼d.—total, 6¾d.; leaving 2s. 9¼d. as the net comparative cost of gas per 1000 cubic feet to consumers in Greenock if the conditions had been equal to those in Paisley. There was also a heavy sinking fund in Greenock, as compared with Paisley. It is not always advisable to institute comparisons between different gas-supplying bodies: and I content myself on this occasion with stating, in condensed form, the report of the Sub-Committee. Treasurer Cluckie, it may be added, maintained the accuracy of his previous statements, notwithstanding the report which had been submitted.

The annual accounts of the Greenock Gas Trust were submitted to the Police Board on Tuesday. The revenue was shown to have been £38,985, of which £27,081 was derived from the sale of gas by meter; and the expenditure was stated to have been £38,928—leaving a surplus of £57. For the current year the revenue was estimated at £38,880; and the expenditure, at £37,530—leaving an estimated surplus of £1350. Even with the small surplus of £57, the Board could not hold their hand from "spoiling" the Gas Department, but voted £700 from the contingent fund account to the general purposes account, by which they realized the subsidy which was estimated at the beginning of last year. The pernicious principle of making the gas consumers pay for town improvements was thus perpetuated. If Mr. Stewart could so arrange that he would only have surpluses of £57 for a year or two, he might be able to put a stop to it.

In connection with a recent thunderstorm in Brechin, there was such a heavy fall of rain that the lower parts of the town were flooded. Among the other properties which suffered were those of the Gas Company, in which the water rose so high that the fires were extinguished. Adjoining the gas-works is the United Presbyterian Church, through the grounds of which water, after passing the gas-works, is conveyed in a tunnel. This tunnel was greatly damaged; and the managers of the church have entered into correspondence with the Town Council regarding its repair. The subject came before the Council on Monday; but they do not seem to be desirous to pay any part of the cost of the repair. Their feeling is rather that the Gas Company should bear the cost; and, in support of their view, the Town Clerk read an extract from a letter, dated in 1837, in which two gentlemen, the predecessors of the Gas Company, are supposed to have bound themselves to repair all damage done to or by the tunnel passing through the church property. The subject is under inquiry; legal opinion being apparently necessary to determine whether or not the Gas Company can be held to be liable.

The proposal is made in Millport that the Corporation should acquire the undertaking of the local Gas Company; and a special meeting of the Town Council is to be held on 30th inst., to finally decide as to the adoption of the Burghs Gas Supply (Scotland) Act.

Complaint is made by the Board of Supervision that a nuisance exists in connection with the gas-works at Kirkintilloch, which belong to the Corporation. A letter from the Board, accompanied by a report which asserted that a nuisance under the Public Health Act exists, was read at a meeting of the Town Council this week, and referred to the Gas Committee.

The Greenock Water Trust were in the happy position on Tuesday of being able to make large reductions in the rates charged for water. The domestic rate was reduced from 9d. to 6d.; the public rate, from 1½d. to 1d.; the rate for hotels, &c., from 10½d. to 7½d.; and the maximum rate per 1000 gallons of filtered water supplied by meter, from 5d. to 3·6d.—the minimum rate being reduced from 3d. to 2·4d. This makes the maximum rate for 100,000 gallons, 30s.; and the minimum rate, 20s. The latter charges, it was stated, were the lowest in the United Kingdom; and in the remarks which followed the presentation of the accounts, it was acknowledged that credit for the fortunate position of the Trust was due to Mr. Jas. Wilson, the Engineer to the Trust, who was one of the foremost Water Engineers in the country.

The Cost of the Litigation as to the Gas Supply to the Oldham Out-Townships.—The litigation between the Oldham Corporation and out-townships, with regard to the gas supply, has cost the parties from first to last, a large sum. From a statement just presented to the Royton and Crompton Local Boards, it appears that the total cost to the out-townships was £1316. Of this, £876 represents the expense of the trial, and £440 for the appeal. There are four contributories to the total. Royton paid £312; Crompton, £310; Chadderton, £530; and Failsworth (who were not parties to the appeal), £164.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 19.

Sulphate of Ammonia.—The market remains firm, although business is naturally curtailed for want of supplies. Quotations have been further advanced, and are now at £14 5s.; and, as likely as not, a further increase will be noted during the next few days. How long the present extreme level will be maintained, it is difficult to say. Consumers now, however, abstain from contracting forward, evidently preferring to take their chance rather than risk purchases at the prices demanded for future delivery. Nitrate is again easier, and is now quoted at 9s. 3d. per cwt.

LONDON, *Aug.* 19.

Tar Products.—There is no relief to the depression which has taken hold of this market. Little or no new business is reported, nor is there likely to be any change in the position until the extremely hot weather now prevailing passes away. Prices nominally are: Tar, 12s. 6d. Pitch, 23s. to 24s. Benzol, 90's and 50's, 1s. 5d. Solvent naphtha, 1s. 1d. Toluol, 1s. 4d. Crude benzol naphtha, 30 per cent., 6¾d. Creosote, 1d. Creosote salts, 15s. Carbolic acid, 60's, 1s. 6d.; crystals, 6½d. Cresol, 1s. 6d. Anthracene, nominal, 30 per cent., "A," 1s.; "B,' 8½d.

Sulphate of Ammonia continues strong, and prices have again advanced from 5s. to 10s. during the week. £14 7s. 6d., less 3½ per cent., is about the average figure at which business has been done; while £13 10s. to £13 15s. is being asked for forward delivery. Gas liquor is quoted at 9s. 6d. to 10s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is perhaps rather more inquiry stirring for the lower qualities of fuel for steam, forge, and general manufacturing purposes; and these show a further hardening tendency—quotations in some cases having been advanced 2s. 6d. per ton upon the rates ruling last week. This is, of course, due to the rapidly decreasing stocks in the above description of fuel; very few collieries having now any supplies to offer either in burgy or slack, and consumers having to resort largely to through-and-through coal and the commoner qualities of round coal for steam and engine purposes. Common slack, which could have been bought at the commencement of last week at about 8s. per ton at the pit mouth, has gone up to 10s.; while the better qualities of slack have been fetching 11s. to 11s. 6d.; and through-and-through coal, which was obtainable at 12s., is now quoted at about 14s. per ton at the pit mouth. For the better qualities of round coal, the demand continues almost *nil*, so far as requirements for house-fire consumption are concerned; but prices remain without quotable change—best Wigan Arley and similar qualities of coal averaging 14s. to 15s. per ton at the pit mouth. Although there are reports that a number of the colliery proprietors in this district are willing to resume work at the old rate of wages, there are no indications of a settlement so far as the leading colliery firms throughout Lancashire are concerned. A suggestion which has been very much pushed to the front by the Miners' Federation is that work should be resumed at the old rate of wages, on the condition that no further advance should be asked for until prices get back to the 1891 level. But the principal colliery firms decline to entertain any such proposal for a moment; and certainly some much more reasonable basis will have to be put forward to bring about a resumption of work at the large Lancashire collieries. It is becoming more and more evident that both sides took up at the first a position which was untenable; and some compromise will have to be made if there is to be any settlement of a permanent character. Stocks are holding out fairly well in the better qualities of coal; and in some cases colliery owners state that they will be able to keep their regular customers supplied for another couple of months. A great many of the pits, however, will be at the end of their stocks in two or three weeks; some of them having already cleared out all their supplies. But in these cases they are buying from other districts where the pits are working; and the supplies which are thus obtainable are tending to keep down prices here. In the shipping trade, there has been a fairly active inquiry; but not more than 15s. 6d. to 16s. per ton has been obtained for ordinary Lancashire steam coal, delivered at the ports on the Mersey.

Northern Coal Trade.—The coal trade of the north-eastern district is rendered irregular by the strike in the Midlands and its effects. The northern miners have, by decisive votes, declared that they will not strike; and this has enabled some coalowners to contract more freely forward for coal at the higher prices that are now current for additional contracts. But the demand for coal has been eccentric. The hot weather has minimized the needs of household coal consumers; and it has also lessened the consumption of gas coal, while the depression in manufactures also reduces the night work in factories and the amount of the artificial light needed. There has been an additional demand for steam coals during the past few days, in consequence of the stoppage of many pits in South Wales; and best Northumbrian steam coals have advanced, until as high as 15s. per ton, f.o.b., has been asked for early shipment, while very nearly this price has been paid for one cargo at least. Second-class steam coals are correspondingly dear. Small steam coals have been in requirement for manufacturing purposes, and now command about 6s. per ton. Household coal, for the reason above named, has been very quiet. Bunker coals have advanced sharply; and about 9s. 6d. per ton, f.o.b., is now the current quotation for unscreened Durham qualities, with a full demand. In the gas coal trade, there has not been so much movement; many of the great gas companies having previously laid in considerable stocks of coal. But for uncontracted quantities very high prices are asked, because a considerable

tonnage is being sold for other purposes. Sales of cargoes as high as 9s. per ton, f.o.b. however, are reported. Railway coal has been disposed of in considerable amount, at about 8s. 6d. to 9s. per ton, free on rails. Manufacturing coal is being freely sold; but there is practically no fixed price—the sales being matters of bargaining for each lot. Coke is firm, and is quoted at higher prices—from 16s. to 17s. per ton, f.o.b.; and, though a larger number of ovens are at work, the demand is strong. There is no alteration of moment in the price of gas coke; but the production is steadily, though not rapidly, increasing.

Scotch Coal Trade.—The situation in Scotland is so peculiar that it is difficult, if not impossible, to give quotations as to prices this week. All that has emanated from the weekly gathering of coalowners in Glasgow is that all available lots of coal are being quickly bought up, and that, while it would be hard to say what are the ruling prices for any of the classes, they may be taken as something like 10s. per ton, f.o.b. Glasgow, all round. At the end of last week, the miners, in their various conferences, declined the offer of an advance of 6d. per day; and this week the masters conceded the full shilling asked for. Since then the men have again met, and have formulated a demand for another 1s. advance. They have also resolved to work only five days per week, which greatly hampers the masters, and prevents them taking forward orders, and also militates against the further rise being given. From this cause, though every port is swarming with vessels waiting to be loaded with coal, the supplies are not forthcoming as they should be; and, as a matter of fact, the shipments show a decrease. For the week, they amounted to 157,191 tons—a decrease, as compared with the preceding six days, of 11,426 tons; and, as compared with the corresponding week of last year, of 5239 tons. For the year to date, the total shipments have reached 4,164,801 tons—a decline, compared with the corresponding period of last year, of 372,186 tons.

The Electric Lighting Scheme for Worcester.—The Worcester City Council have decided, on the recommendation of the Watch Committee, to adhere to the proposal to construct a generating station for electric lighting at Powick Mills, and to accept the tender of Mr. T. Rowbotham, of Birmingham, for the erection of buildings, at a cost of £14,797. The estimated cost of the scheme is £40,000; but, according to the Mayor (the Hon. A. Percy Allsopp, M.P.), the expenditure is likely to reach £50,000. Mr. W. H. Preece has been appointed Consulting Engineer.

The Yeadon Local Board and Electric Lighting.—At a recent meeting, the Yeadon Local Board had under consideration the question of supplying a portion of the township with electricity, both for public and private purposes. Representatives of the firm of Messrs. Andrews and Preece, of Bradford, submitted details of a scheme for 1500 8-candle lamps, the cost of which, exclusive of land and buildings, they put down at £3500. The members of the Board were favourably impressed with the scheme, and resolved to make application to the Board of Trade for a Licence to empower them to undertake the supply of electricity.

Electric Lighting for Coventry.—Early in 1892, the Electric Lighting Committee of the Coventry City Council visited the Electric Lighting Exhibition held at the Crystal Palace; and this led to the Council authorizing, in April of that year, the Committee to accept schemes and estimates from electrical engineering firms for the establishment of a central electric light station. Since then they have been pursuing their investigations, with the result that last Tuesday (more than two months after the period had expired in which, according to their Provisional Order, they were to have the mains laid in a specified area) they submitted the following recommendations to the Council: That the Corporation do themselves undertake the supply of electrical energy: that the high-tension alternating transformer system be adopted for private lighting, and that street lighting be not at present undertaken; that a site in Sandy Lane be purchased at £350 an acre; that a station be erected there of 150 kilo-watt capacity, to supply 4300 8-candle power lamps, with mains and transformers suitable for 12,000 similar lamps; and that the Committee be instructed to frame and submit to the Council an estimate of the total capital outlay required, for the purpose of an application to the Local Government Board for the necessary borrowing powers. They believed the amount required would not exceed £15,000. The report was passed without dissent.

An Electric Lighting Installation for Halifax.—An inquiry was held at Halifax last Wednesday, by Colonel Hasted, on behalf of the Local Government Board, in reference to an application by the Corporation to borrow £30,000 for the purposes of electric lighting, and £21,393 for sewerage works and street improvements. The Town Clerk (Mr. Keighley Walton) stated that the electric lighting scheme had been prepared by Mr. T. P. Wilmhurst, the Corporation Electrical Engineer; and it was approved by Mr. W. H. Preece. It had been decided to have the buildings at the gas-works. The estimated cost was about £27,000; and the Corporation wished to borrow £30,000, and spread the repayment over 50 years. Mr. Wilmhurst was examined, and said the permissive area of supply was the whole of the county borough; but the compulsory area comprised certain streets within the borough. The plant proposed to be put down at first would be sufficient for about 10,000 lights; and it could be cheaply and easily extended. The amount proposed to be expended on mains was £9000; the area being a large one. He believed the scheme could be worked at a profit. Mr. Waugh, barrister, opposed the application on behalf of several ratepayers and the Halifax Electric Light and Power Company. He said the Company, which was formed in 1889, had laid out £6000 in supplying a portion of the borough. The Corporation had used them for the purpose of getting the chesnuts out of the fire; and now, when they saw there was a chance of the electric light being made a success, they were going to bring in a system of their own. The Company had acted on certain promises which had been made and which the Corporation had not carried out. They would have opposed the granting of the Provisional Order had they not received certain assurances. Dr. F. H. Bowman, the Chairman of the Company, gave evidence against the scheme; and the second subject of the inquiry was then entered into.

The Position of the Manchester Water Supply.—There has again been a serious falling off in the quantity of water in the Longdendale reservoirs of the Manchester Corporation; and, according to some remarks made by Sir John Harwood at last Wednesday's meeting of the City Council, there was then only sufficient for 37 days, so that it may be necessary before the next meeting to again stop the supply in the night time. The Water Committee, he says, are fully alive to the importance of this matter, and will not do this unless it becomes absolutely necessary.

Oldham Corporation Water Supply.—At the meeting of the Water Committee of the Oldham Corporation last Wednesday, it was reported that on the 2nd inst., the quantity of water in store was 726,670,000 gallons, and on the 16th of August, 708,430,000 gallons; being a decrease of 18,240,006 gallons. At the corresponding date last year the stock was 1,064,080,000 gallons; showing a decrease of 355,650,000 gallons. The stock of water at Castleshaw and Grimesdale is equivalent to six weeks' supply, and at Denshaw and Piethorn, to 5¼ weeks' supply—total, 11¼ weeks' supply. On the application of a millowner for a supply of water to fill his reservoir at the cheap rate—3d. per 1000 gallons—a short discussion took place, and it was decided not to accede to the application, in view of the lowness of the stock of water available.

The East London Water Company and the Leyton Lammas Lands.—A compromise having been arrived at with the East London Water Company with regard to the Leyton Lammas Lands, over which the Company some months ago laid a line of rails, and thus, it was alleged, infringed the rights of the commoners, a demonstration, organized by the Leyton Lammas Lands Defence Committee, was held last Saturday evening on the lands, in commemoration of the preservation of common rights to the people. The Chairman (Mr. E. J. Davis) said, under the agreement which had been arrived at with the Company, all claims to enclose any part of the marshes had been given up by them, and they had also decided to discontinue the actions brought against Messrs. Musgrave and Humphreys, and to pay their costs. The Company had also promised to pay £100 towards the cost of making up the bridle path, and to afford the commoners every facility for erecting a bridge across the stream in order to connect the Hackney and Leyton Marshes. The commoners in turn resolved to grant the Company an easement for a line of metals connecting their works with the railway.

The Position of the Water Supply of Leeds.—At the meeting of the Leeds Corporation Water Committee about a fortnight ago, it was reported that the water stored in the various reservoirs was equal to 36 days' supply at the then rate of consumption; and they deemed it necessary to warn the public how matters stood, and to indicate what would probably be the result unless the consumers exercised more care. Last Friday they met again; and the Engineer (Mr. T. Hewson) informed the members that the water in store was equal to 37½ days' supply, as compared with a supply for 101½ days twelve months back. A fortnight since, attention was drawn to the fact that the daily consumption of water was 14,646,000 gallons, or at the rate of 36 gallons per head of the population. Inasmuch as the average in other towns is 24 gallons per head, it was thought that a large quantity must be wasted in Leeds. The warning issued by the Committee had the effect of reducing the daily consumption to 12,734,000 gallons; but the improvement was only of a temporary character, for during the past week the quantity used per day was 14,300,000 gallons. The Committee have decided to cut off the water from midnight to five o'clock in the morning, without further notice, if the supply falls below one sufficient for 30 days.

Worthing Water Supply.—The Worthing Town Council have made an agreement with the Shoreham Water Company to supply to Worthing from 80,000 to 150,000 gallons daily for twelve months; and the work of laying the mains, which will be immediately proceeded with, is expected to be completed in about three weeks or a month. In the meantime, an important addition to the present supply has been furnished from an unexpected source. During the consideration of other schemes, the ex-Mayor (Alderman Cortis) has at his own expense been conducting boring operations in a meadow in the village of Broadwater, close to the town; and last Thursday the experiment proved to be a complete success. With the temporary appliances, water is being pumped up from the chalk at the rate of 20,000 gallons an hour. It appears that at a depth of 80 feet through a heavy stratum of chalky marl the hard chalk was reached, and a copious spring was tapped, and by means of a centrifugal pump, worked by a traction-engine, nearly 500,000 gallons were discharged in the course of 24 hours. The greatest satisfaction prevails throughout the borough. Alderman Cortis on visiting the spot on Thursday was loudly cheered by the assembled townspeople. Mr. E. Harrison, the owner of the soil, has most generously placed the whole of the water unreservedly at the disposal of the town.

The Agitation against the Price of Gas on the North of the Thames.—A special meeting of the supporters of the Gas Consumers' Protection League (a body recently formed to obtain a reduction in the price of gas in the district of The Gaslight and Coke Company) was held last Wednesday evening, at the Foresters' Hall, Clerkenwell Road, under the presidency of Mr. J. Rowlands, M.P. The accession of several of the Metropolitan Members of Parliament, besides some large consumers, to the ranks of the League, was reported. The Chairman said he was dissatisfied with the explanation given by the Company for the lower price charged by them on the other side of the river; and a motion was unanimously adopted expressing the "extreme disappointment with which the League learnt that, at the recent half-yearly meeting of The Gaslight and Coke Company, the Governor did not, on behalf of himself and colleagues, announce a substantial reduction in the price charged to gas consumers north of the Thames." A further resolution was carried inviting all Members of Parliament representing the districts north of the Thames served by the Company to join the League, and render all possible support. It was announced that public meetings would be held later on in different parts of London, with the view of promoting the objects aimed at by the organization.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO., TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

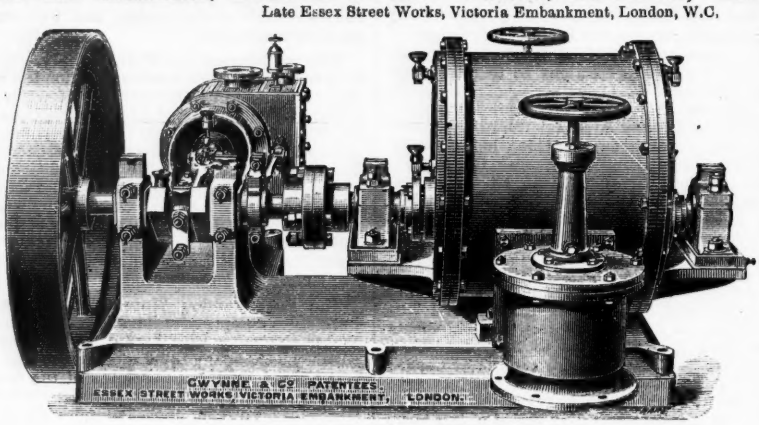
Late Essex Street Works, Victoria Embankment, London, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, London, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEAR DALKEITH, }

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

GAS Companies, Corporations, and Chemical Manufacturers interested in the extraction of Cyanogen Compounds are hereby advised that I am prepared to INTRODUCE PROCESSES ADAPTED TO THE RECOVERY OF CYANOGEN as Crude Prussian Blue or Yellow Prussiate of Potash.
These Processes are now in practical operation in England and the United States, and are covered by Letters Patent.
For particulars, apply to S. DYSON, Chemical Works, Frizinghall, BRADFORD.

ADVERTISER seeks re-engagement in large or small Works as STOKER. Used to Ordinary and Generator Firing. Age 23; abstainer.
Apply H. SCHOFIELD, Gas-Works, New Mill, HUDDERSFIELD.

WANTED, two good Stokers used to Shovel charging. None but steady men need apply. Wages 27s. 6d. per week.
Apply to the GAS-WORKS, ABERYSTWITH.

KEGWORTH GAS-WORKS.

WANTED, a Man to manage (single- handed) the above Works. Production about 8 millions. House with good Garden, Gas, and Coal.
Apply, stating age, wages, and present occupation, to J. A. UTTING, Secretary, Gas Company, Kegworth, near DERBY.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. IV., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

PATENTS, DESIGNS, AND TRADE MARKS.

INVENTIONS Protected by Letters Patent. TRADE MARKS REGISTERED at home and abroad. Advice on all questions relating to above. Handbook gratis.
Apply to J. C. CHAPMAN, Chartered Patent Agent, 70, Chancery Lane, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works sundries.
Telegrams: "HUTCHINSON BROS., BARNSLEY."

WANTED, a Gas-Meter Inspector.
Wages 27s. per week.
Apply, by letter, giving references, to No. 2271, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, two good Stokers used to charging by Shovel, and with a knowledge of Exhauster, &c. Total Abstainers preferred. Testimonials from last employer.
Apply to F. ARMITAGE, Manager, Gas-Works, Market Harborough, LEICESTERSHIRE.

THE Romford Gas and Coke Company, Limited, require the services of a Man as BLACKSMITH and MAINLAYER, and competent to do general repairs to Machinery and Plant on the Works.
Applications, stating age and qualifications, may be addressed to
W. D. CHILD,
Engineer and Manager.
Gas-Works, Romford, Essex.

EXHAUSTER (Rotary), perfectly New (Makers, Dempster and Sons), 20,000 cubic feet per hour, ON SALE, cheap
Apply to T. G. MARSH, 41, Corporation Street, MANCHESTER.

FOR SALE—A 5000 feet Exhauster, by Gwynne, with outside Bearings and Couplings; also one without outside Bearings. Both in good condition.
Apply to J. CHAMBERS, Gas-Works, HENLEY-ON-THAMES.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore, Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

LIQUOR, Tar, and Spent Oxide wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

GAS CANNEL.

FOR SALE—1000 tons of North Wales SMOOTH CANNEL, immediate delivery. Gas per ton, 11,300 cubic feet. Illuminating Power, 23 candles.
Apply to MONTAGU HIGGINSON AND CO., 6, York Buildings, LIVERPOOL.

CORPORATION OF BIRMINGHAM.

FOR SALE—Three Massive Brass GASALIERS, until recently used for lighting the Town Hall, Birmingham.
These Gasaliers are now re-lacquered as new, and are complete, ready for re-fixing.
Apply to the FITTINGS SUPERINTENDENT, Gas Department, Council House, BIRMINGHAM.

SPECIAL BARGAIN.

FOR SALE—Two perfectly new Cast- Iron SCRUBBERS, 10 feet diameter by 50 feet high, with Wrought-Iron Domes, Cast-Iron Spiral Staircase, &c., complete. All plates machine planed. One or both Scrubbers will be sold to suit purchasers.
A perfectly new 30,000 per hour HORIZONTAL DOUBLE PUMP RECIPROCATING EXHAUSTER, with Steam-Engine, with Connections and Valves.
One Second-hand (thoroughly overhauled) VERTICAL PUMP EXHAUSTER, with Steam-Engine (with clean Water and Liquor Pumps attached), to pass 7000 cubic feet of Gas per hour.
The whole of the above Plant can be inspected, and full particulars with prices will be sent, on application to No. 2241, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR AND LIQUOR.

THE Eccleshill and Bolton Gas Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR, to be produced at their orks, together or separately, for Twelve Months om the 1st of September next. Can be delivered in Contractor's Tanks at the Station (G.N.R.).

Coal carbonized per annum, about 1800 tons

Tenders, sealed and endorsed, must reach me not later than Monday, the 4th of September.

J. MELLOR,
Secretary.

Eccleshill, Bradford.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TO TAR DISTILLERS.

THE Directors of this Company invite TENDERS for the purchase of 700 tons of the surplus TAR now in stock and to be produced at their Works in Radcliffe during the ensuing Ten Months.

Particulars may be obtained from the undersigned, to whom endorsed tenders must be delivered not later than Thursday, the 31st inst.

JAMES BRADDOCK,
Manager and Secretary.

Gas-Works, Radcliffe,
Aug. 16, 1893.

BOROUGH OF WIDNES.

THE Widnes Corporation invite Tenders for the purchase of about 700 tons of GAS TAR from their Gas-Works for the Twelve Months ending the 30th of September, 1894.

Forms of Tender and Conditions of Contract may be obtained from Mr. I. Carr, Assoc.M.Inst.C.E., Gas-Works, Widnes.

Endorsed tenders to be delivered to the undersigned not later than the 4th of September prox.

The Corporation do not bind themselves to accept any tender.

H. S. OPPENHEIM,
Town Clerk.

Town Hall, Widnes,
Aug. 12, 1893.

THE GASLIGHT AND COKE COMPANY.

TENDERS FOR COKE.

THE Directors of this Company are pre-pared to receive TENDERS for the purchase of COKE, to be supplied into Ships, Barges, or Railway Trucks, at their Beckton, Nine Elms, Bromley, and Fulham Stations within the Twelve Months ending the 30th of September, 1894.

Particulars and Forms of Tender can be obtained upon application at this Office.

Tenders to be sent in at or before Noon on Thursday, the 31st inst., addressed to me, and endorsed "Tenders for Coke."

The Directors do not bind themselves to accept the highest or any tender.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Aug. 18, 1893.

CORPORATION OF LEICESTER.

SULPHURIC ACID.

THE Gas Committee of the above Cor-poration are prepared to receive TENDERS for the supply of SULPHURIC ACID, made either from Native Sicilian Brimstone, recovered Sulphur, or Pyrites. Specific gravity in each case to be stated. The price to include free delivery by Rail into elevated tanks, 27 feet high, at the Chemical Works Aylestone Road Gas-Works.

Probable quantity about 1200 tons, to be delivered as required during the ensuing Twelve Months.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Acid," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Aug. 26.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Aug. 16, 1893.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Gloucester Gas-light Company invite TENDERS for the surplus TAR produced at their Works for One, Two, or Three Years, from the 1st day of October next.

The Tar will be delivered into Boats or Barges at the Company's Wharf, on the Gloucester and Berkeley Canal.

Offers to be at per ton of 200 gallons, and per ton by weight,

Payments, cash monthly.

Further Particulars may be obtained on application to Mr. R. Morland, the Company's Engineer.

Sealed tenders, endorsed "Tender for Tar," and addressed to the Chairman, Gas Offices, Eastgate, Gloucester, to be delivered not later than Wednesday, the 30th day of August inst.

The Directors do not bind themselves to accept the highest or any tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
Aug. 10, 1893.

Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Pro-perty Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11 Ludgate Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at the Offices, Willoughby Lane, Tottenham, on Saturday, the 26th day of August inst., at Half-past Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend, for the Election of Two Directors and an Auditor for the ensuing Year, and for transacting General Business.

The Transfer Books for Consolidated Stocks will be closed from the 12th to the 28th inst.

By order,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Aug. 11, 1893.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 1st of September, 1893, at Two o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1893, to declare Dividends, to elect Auditors, and for other purposes.

And Notice is hereby given that, immediately after the Ordinary General Meeting, a SPECIAL GENERAL MEETING will be held, at which the Directors will submit the following Resolution to the Proprietors:—

"That the Directors are hereby authorized to convert the Original Shares of the Company into Original Consolidated Stock, the 'A' Ordinary Shares into 'A' Ordinary Consolidated Stock, and the 'B' Preference Shares into 'B' Preference Consolidated Stock."

And Notice is hereby given, that at the said Special General Meeting the Directors will apply to the Proprietors to pass such Resolution or Resolutions as to the Meeting may appear expedient for the purpose of authorizing the raising of further Capital in pursuance of the Provisions of the Brighton and Hove Gas Act, 1893.

The Transfer Books of the Company will be closed from the 19th of August to the 1st of September, both days inclusive.

By order,
W. H. HARDY,
Secretary

Offices: 5, Great Winchester Street,
London, E.C., Aug. 14, 1893.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

To effect a great saving in

GAS-FURNACES use our

Special Derbyshire **GANNISTER BRICKS.**

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ALBERT WORKS, WIDNES.

MEIKLEJOHN'S PATENT

Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.

Is cheap and easily fixed to any form of main.

Will be found the most efficient appliance of the kind yet introduced.

Further particulars and price from

C. MEIKLEJOHN,
GAS-WORKS, RUGBY.
(Late N. MEIKLEJOHN, Longwood.)

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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NEWBATTLE COLLIERIES,
DALKEITH, N.B.

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effecting a great saving of time labour, and expense.

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Prices are Reduced.

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FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

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Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

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JAMES OAKES & Co.,

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Wenlock Iron Wharf, 21 & 22, Wharf Road,
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Manufacture and keep in Stock at their Works
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BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

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HARTON COAL COMPANY,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

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SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

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These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

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TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·8 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

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COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

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HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

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HOLMSIDE AND SOUTH MOOR OFFICES,

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REGENERATIVE FURNACES.

Unsurpassed in

Efficiency, Economy, Durability, and Easy Working.

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ANALYSIS AND PRICES ON APPLICATION.

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THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.

Yield of Coke: 13½ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

Wrought-Iron

And Fittings and Accessories.

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A FIRST-CLASS CANNEL COAL,

Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.

FOR ANALYSIS, PRICE, AND ALL OTHER PARTICULARS, APPLY TO

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Telegrams: "BENHAR, Edinburgh."

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

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RAVENSTHORPE, NEAR DEWSBURY.

FAMOUS LEESWOOD

"CURLEY CANNEL."

YIELD: 15,306 CUB. FT. PER TON OF 30·62-CANDLE POWER.

SMOOTH CANNEL.

YIELD: 12,321 CUB. FT. PER TON OF 21·321-CANDLE POWER

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GAS COAL. BEST REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
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For price to any part of England and Wales for any description of **CANNEL, COAL,** or **COKE,** please apply to

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INCLINED RETORTS,
FIRE BRICKS,
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BLOCKS, &c.
Special Bricks for Intense Heats.

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CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

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Fire-Brick Works, STOURBRIDGE.

☞ Retort Setters sent to any part of the Kingdom.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
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G. WALLER & CO.'S NEW PATENT GAS EXHAUSTER
MADE WITH FOUR BLADES,
To pass 300,000 Cubic Feet per Hour, with or without Engine combined.
IN USE AND ON ORDER FOR OVER 100 WORKS,
AND EQUAL TO
5,340,000 CUBIC FEET PER HOUR.

SPECIAL ADVANTAGES:—

The Four-Blade Exhauster **PASSES 50 PER CENT. MORE PER REVOLUTION** than any One or Two Blade Exhauster.
It takes 27 per cent. less power than any Two-Blade Exhauster.
It gives a steadier Gauge than any other Exhauster.
One of our 150,000 feet per hour Patent Four-Blade Exhausters passes continuously **180,000** cubic feet per hour, driven by a **12-INCH STEAM CYLINDER.** No other Maker can give a similar result.
Model of Patent Exhauster sent for inspection.
Oldest Makers of Beale Exhausters for over 300 Works.
Patent Compensating Steam Governor, Special Tar and Liquor Pumps, Gas-Valves.
Washer-Scrubbers, with **WOOD CLUSTERS,** and Tar Extractor combined.

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Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

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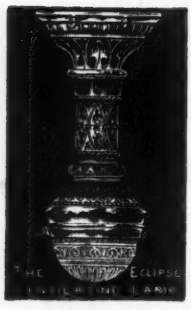
With Recent Improvements.



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CHEAPEST! MOST ORNAMENTAL AND RELIABLE!

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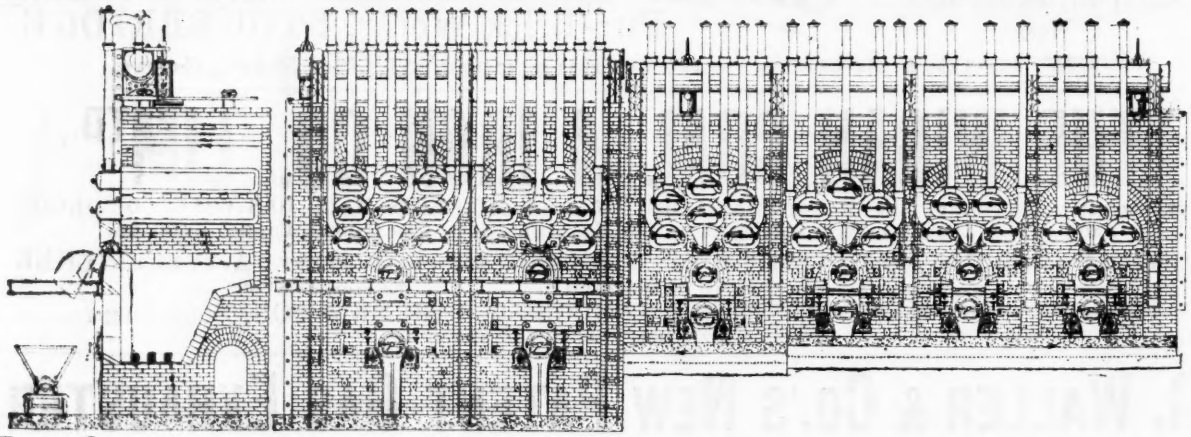
HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS, AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES.

THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings, or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stewart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge, and from R. F. HISLOP (son of Patentee), Gas-Works, Paisley.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED, AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS

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All Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

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RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

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THE LARGEST GASHOLDER IN THE WORLD.

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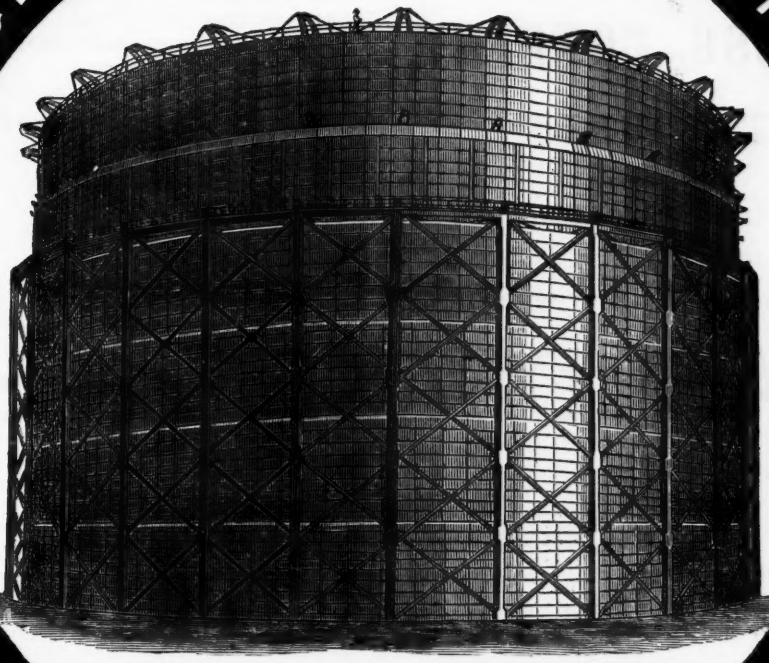

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company
IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR

MAKERS OF GAS PLANT OF EVERY DESCRIPTION
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TELEGRAPHIC "GAS, LEEDS."
GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

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A. G. GLASGOW, M.E.,
Late General Inspector,
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Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
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3. Uniformity in thickness, ensuring equal Expansion and Contraction.

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MACHINE-MADE GAS-RETORTS.

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CASTINGS OF EVERY DESCRIPTION.

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Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

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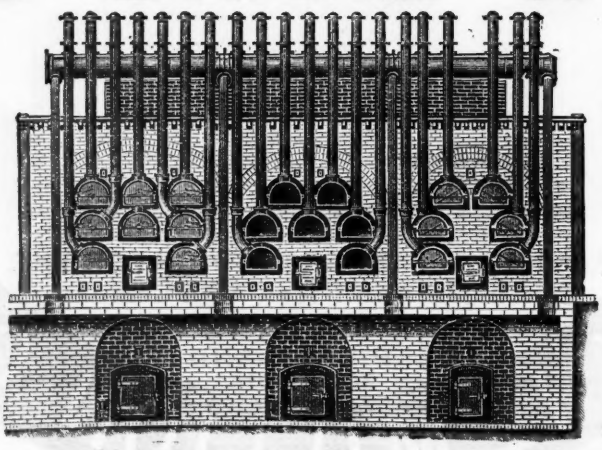

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REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

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GAS PLANT WORKS,

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Makers of every kind of Gas Apparatus and Structural Ironwork.

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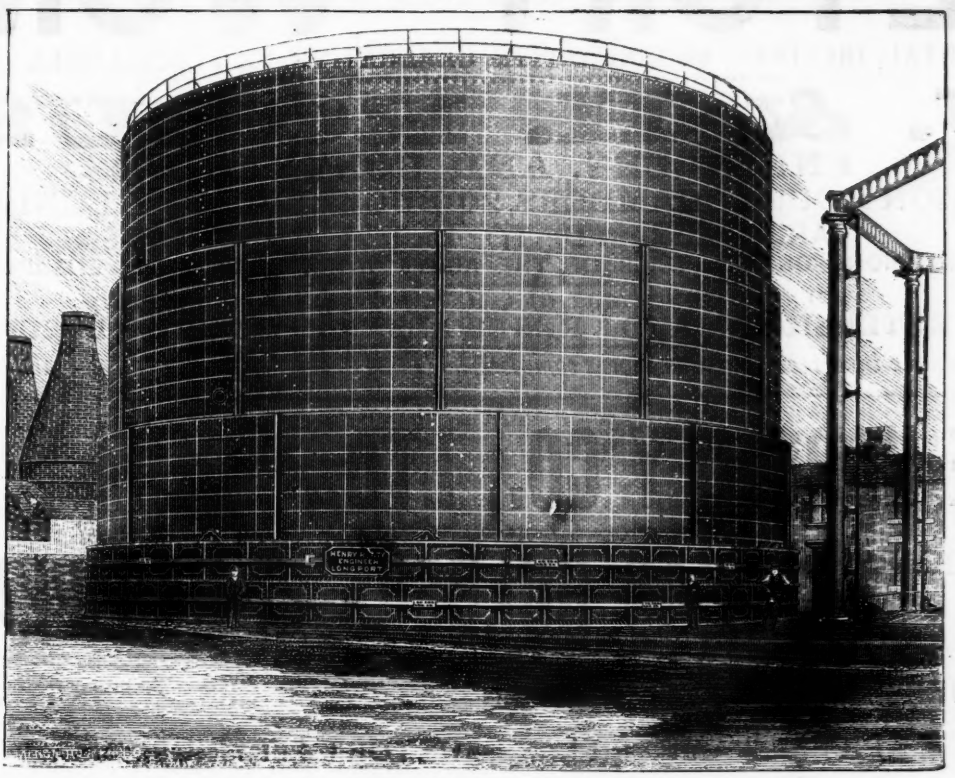
SPIRAL-GUIDED GASHOLDERS,

WHEREBY COSTLY GUIDE-FRAMING IS DISPENSED WITH.



Telegraphic Address: "SCRUBBER MANCHESTER."

Further Particulars and Estimates on Application.

Three-Lift Spiral-Guided Gasholder, working in a Cast-Iron Tank made with planed joints, erected at the Longport Gas-Works of the Burslem Corporation. Bottom Lift, 90 ft. diameter and 20 ft. deep.

NOTHING SUCCEEDS LIKE SUCCESS.

Upwards of thirty Gasholders have now been erected or ordered upon this System; and their stability has been proved under the most varied conditions. A list of these will be sent on application.

The reader's attention is invited to the fact that our position as Makers of **SPIRAL-GUIDED GASHOLDERS, THE SAFEST AND BEST** of the several types of Columnless Gasholders, has not been modified by any recent adjustment of legal proceedings.

IMPORTANT TO ENGINEERS AND GAS COMPANIES.

A NEW CARBURETTOR FOR ENRICHING GAS IN BULK.

The Carburettors have been doing practical work for the past two years; in many cases doing all the enrichment without the use of Cannel or other rich Coals. The South Metropolitan Gas Company have these Enrichers at all their Stations. The Gaslight and Coke Company have had them in use at some of their principal Works for two years past; and several more are now being fixed at their other Stations. The Carburettors are also in use at several Suburban and Provincial Gas Companies' Works.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

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RETORT WORK

HORIZONTAL, INCLINED, REGENERATIVE, GENERATIVE, OR FLOOR-LEVEL SETTINGS.

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FOR EXTENSIONS OR RENEWALS OF THE ABOVE WORK DURING THE ENSUING SEASON.

PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED

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Contractors for the Erection of Gas-Works complete, including Gasholder Tanks of all sizes and Main Laying.

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MAKERS OF

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PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES,

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ALSO ALL KINDS OF

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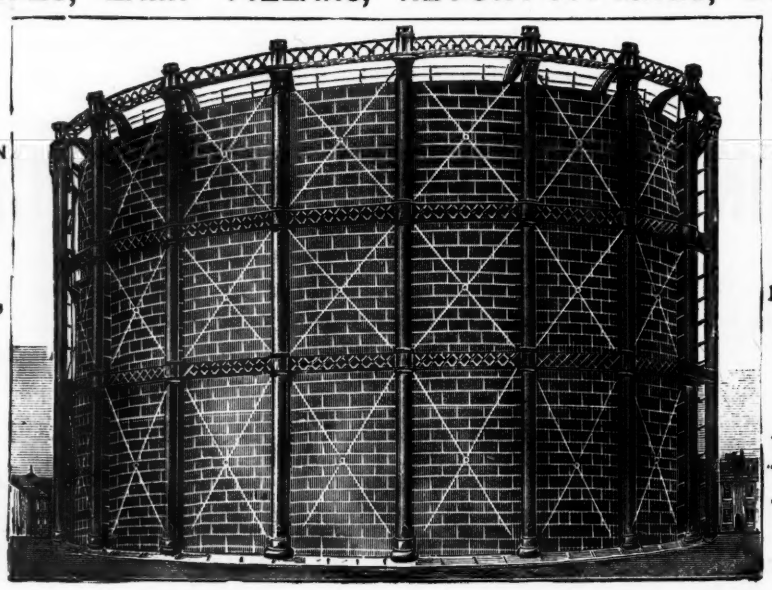

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[See also Advt., p. 348.

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